

Volume

6

GAISSER **EDM** TOOLING, INC.

Precision Tooling for Wire EDM Machines – Made in the USA

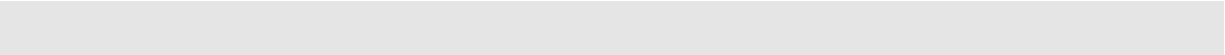


Instruction Manual

Volume 6

INSTRUCTIONS FOR WIRE EDM TOOLING

Volume 6 - 2002



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Using the CK01 Toe Clamp Kit

The toe clamp is designed with a relief at the clamping area to allow the clamp force to be applied beyond the edge of the work piece. This clamp design eliminates the possibility of tilting the work piece with the clamp force. It is desirable to use two toe clamps or more, if possible, to assure stable toe clamping of a work piece. The toe clamp can be attached directly to the machine table or to the rail. The thickness of the work piece determines how the toe clamp will be connected.

STEP 1. For work pieces from 0.0 inches to 2.0 inches thick, the threaded rod is attached to the toe clamp as shown in Fig. 1.

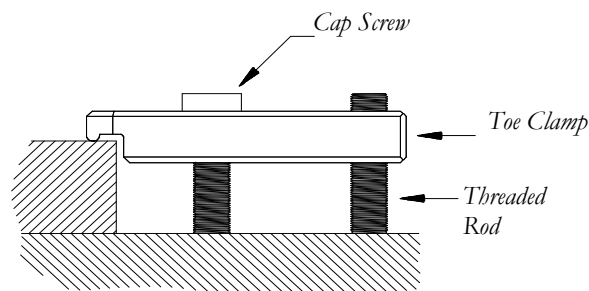


Figure 1

STEP 2. The cap screw is attached to the toe clamp and table or rail and is used to apply the clamping force.

The thin work piece requires the use of the short cap screw and short threaded rod. The thick work piece requires the use of the longer cap screw and the longer threaded rod.

STEP 3. For work pieces from 2.0 inches to 4.0 inches thick, the threaded rod is attached to the toe clamp as shown in Fig. 2.

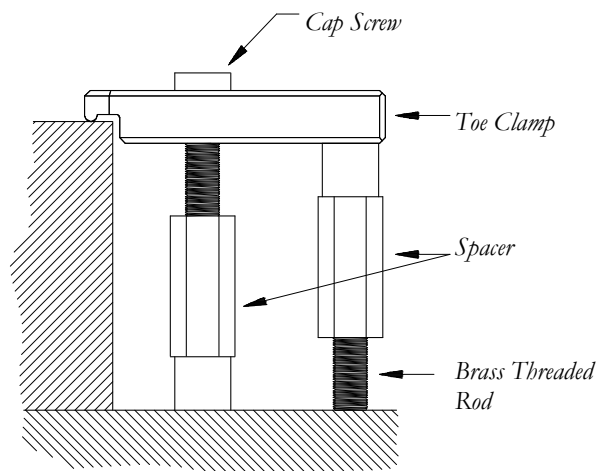


Figure 2

STEP 4. The threaded rod is attached to the spacer, which forms a rigid base for the toe clamp.

STEP 5. Another spacer is attached to the table or the rail as shown in Fig. 2.

STEP 6. The cap screw is attached to the toe clamp and the table spacer to apply the clamping force.

STEP 7. For work pieces from 4.0 inches to 6.0 inches thick, an additional spacer is attached to both spacers as the one shown in Fig. 3.

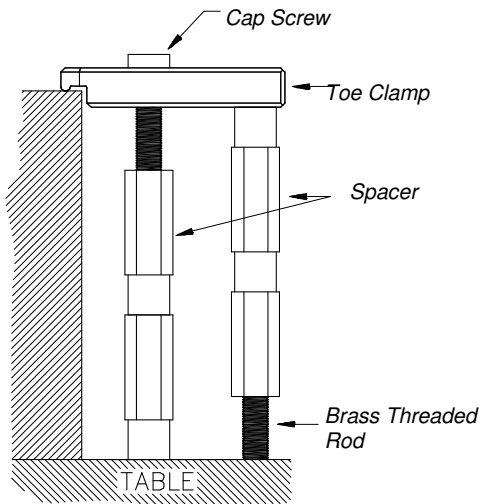


Figure 3

Note: An additional spacer is attached as the thickness of the work piece increases in increments of 2.0 inches.

STEP 9. The toe clamp attached directly to the rail is shown in Fig. 4. The advantage to clamping to the rail is easy alignment of the work piece.

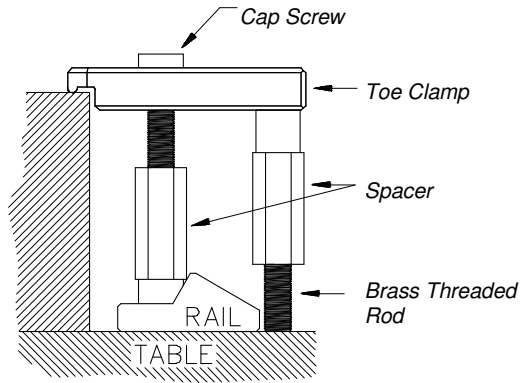


Figure 4

NOTE: Do not allow the clamp bolt to bottom out on the table. It may damage the rail and the table. If necessary, use thin shim between the clamp and work piece.

USING THE TC01 EXTENDIBLE TOE CLAMPS

The extendible toe clamps, are designed to be used as an inexpensive holding device. The clamp can be used by itself, with other extendible toe clamps, with toe clamps or with other work holders. The top of the bottom plate on the clamp is at the zero level when the clamp is used on a zero-level table as shown in Fig. 1.

Note: For tables that are not at the zero level in the z-axis, the use of spacers is recommended. If the table is a sub-level Meca table, Meca spacers are required to bring the table to the zero level.

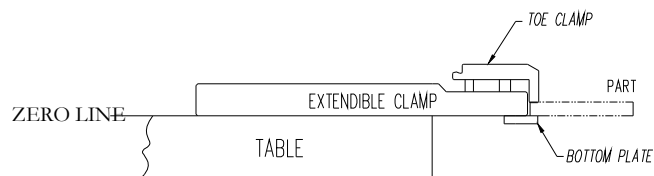


Figure 1

STEP 1. For work pieces from 0.0 inches to .625 inches thick, the brass, threaded rod is attached with the extended end of the clamp holding the work piece as shown in Fig. 2.

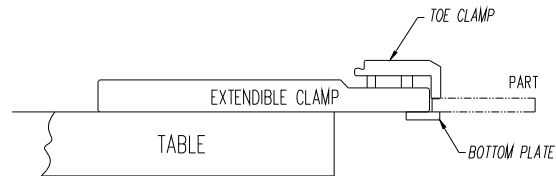


Figure 2

STEP 2. The short cap screw is attached to the toe clamp and support, and is used to apply the clamping force.

STEP 3. For work pieces from .625 inches to 3.5 inches thick, the toe clamp is reversed and uses a brass threaded rod and cap screw of varying length depending on the thickness of the work piece as shown in Fig. 3.

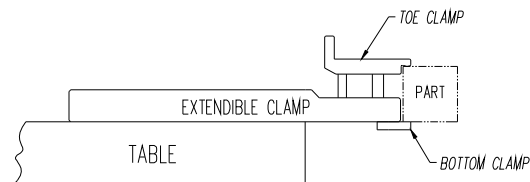


Figure 3

STEP 4. For work pieces from 3.5 inches to 6.0 inches thick, a coupler is used to connect two brass, threaded rods together as shown in Fig. 4.

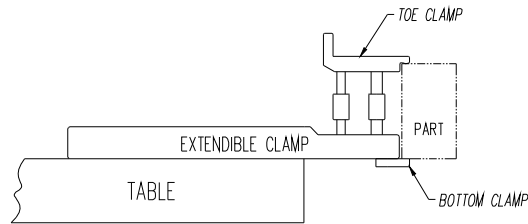


Figure 4

STEP 5. A second coupler is used to connect the cap screw and a brass threaded rod together to apply the clamping force as shown in Fig. 4. The length of the brass rod and the cap screw is determined by the thickness of the work piece.

STEP 6. If the work piece being held by the extendible toe clamp requires an adjustment in height, adjustment screws on the bottom of the plate can be adjusted so as to raise the part in the Z-axis as shown in Fig. 5.

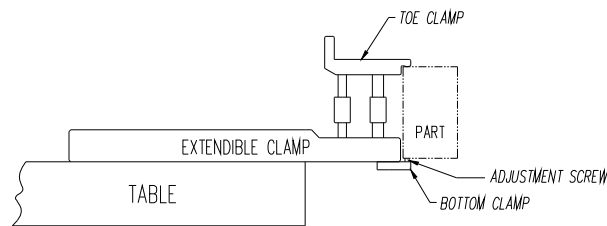


Figure 5

NOTE: The top of the bottom plate is at the zero level z-axis height. If the work piece needs to be lower than this level, the work piece must be raised on its opposite side before height adjustment can be achieved.

STEP 7. If the work piece is supported exclusively by extendible toe clamps, whenever possible, set the clamps up with two clamps on the corners of one side of the work piece and one clamp in the center of the opposite side of the work piece as shown in Fig. 6.

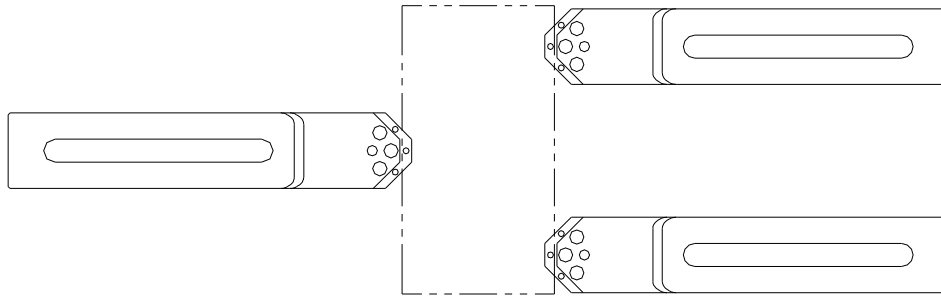


Figure 6

STEP 8. Leveling using three-point truing. (A). Place the indicator onto the work piece next to any of the extendible toe clamps and zero set the indicator. **(B).** Move the indicator to the second extendible toe clamp and adjust the adjustment screw(s) until the indicator returns to zero. **(C).** Move the indicator to the third extendible toe clamp and adjust the adjustment screw(s) until the indicator reads zero. The part should be level. If not, repeat **8A-C** until level.

STEP 9. If the extendible toe clamp is used with another work holder, the work piece should be trued first in the work holder. After the part is trued, the extendible toe clamp can be used for additional support as shown in Fig. 7.

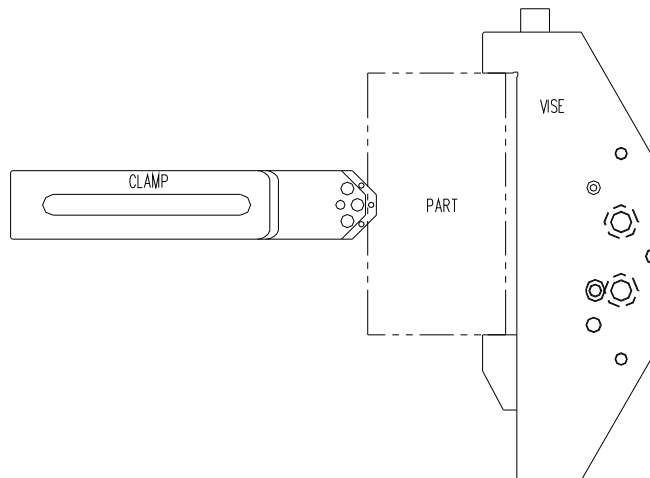


Figure 7

NOTE: In order to not take the work piece out of true, position the extendible toe clamp's bottom plate under the side of the work piece it is to support, adjust the adjustment screw(s) to snug or until they just touch the work piece, then apply the clamping force to the work piece with the toe clamps.

Attaching the Rail to the Machine

STEP 1. (OPTIONAL) APPLYING GREASE TO THE RAIL Assure the machine table or the beam top is clean and free of nicks, burrs or dents. Apply a thin layer of clean silicone grease to the bottom of the rail as shown in Fig. 1.

NOTE: *The grease will eliminate any corrosion between the rail and the table.*

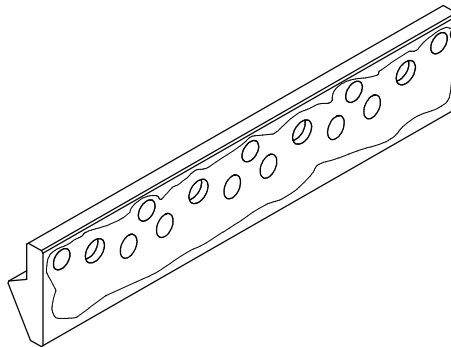


Figure 1

STEP 2. ATTACHING THE RAIL TO THE MACHINE. Place the rail on the machine table as shown in Fig. 2 with the slanted side away from the work area.

STEP 3. (A). Apply ample silicone grease to the threads of the special low head cap screws. The grease will eliminate the screws from seizing. **(B).** Insert the screws into the counter-bored holes in the rail and into the threads in the table. **(C).** Using the hex wrench, lightly snug down the two end screws into the table.

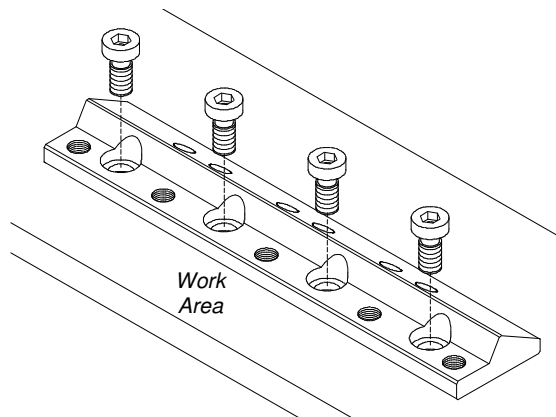


Figure 2

STEP 4. INDICATING THE RAIL PARALLEL TO THE MACHINE. (A). Attach a dial indicator to the z-column of the Wire EDM machine. **(B).** Adjust the indicator needle to the back of the rail as shown in Fig. 3. **(C).** Move the machine travel across the length of the rail. **(D).** Using a plastic or rubber hammer, tap the rail parallel over the length of the rail.

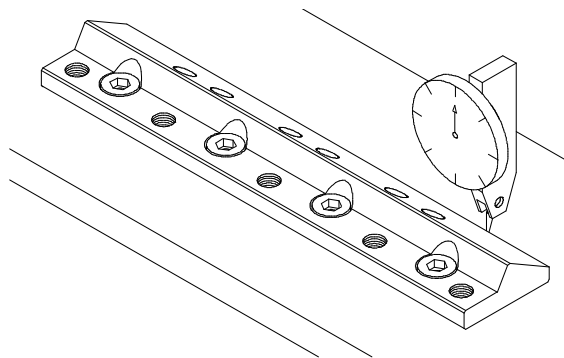


Figure 3

STEP 5. Secure the screws tight and check the rail again for parallel. **DO NOT EXCEED THE RECOMMENDED TORQUE BY THE MACHINE MANUFACTURER.**

STEP 6. Wipe clean any excess grease from the rail and the table.

THE RAIL IS ONLY AS GOOD AS HOW PARALLEL IT IS TO THE MACHINE.

When using the threaded hole in the rail for toe clamping, make sure the bolt does not bottom out on the machine table. If the bolt is allowed to bottom out, damage may occur to the table and/or the rail. Use shim between the toe clamp and the work piece if needed.

Attaching the Rail to the Surface Plate

STEP 1. PREPARING THE SURFACE PLATE AND RAIL

Unpack the surface plate from the shipping container and place it on a workbench. Two 8mm threaded inserts are supplied in the plate as shown in Fig. 1.

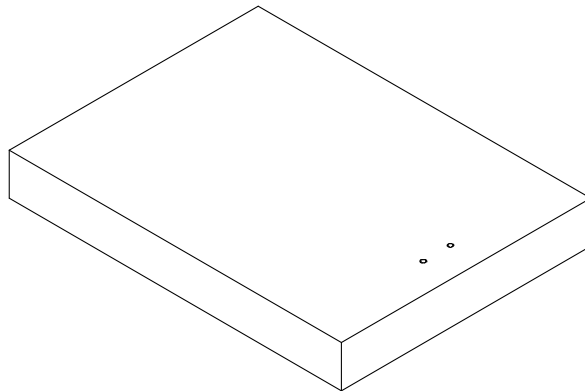


Figure 1

STEP 2. Assure there is no dirt or contamination in the two holes or on the surface where the rail will attach.

STEP 3. ATTACHING THE RAIL TO THE SURFACE PLATE (A). Place the rail on the surface plate over the two inserts, while keeping the slanted side facing the closest end of the plate as shown in Fig. 2. **(B).** Insert the special low head screws in the counter-bored holes in the rail. **(C).** Using the hex wrench, tighten the two screws to 10 ft.-lb. torque. **DO NOT OVER TIGHTEN.**

The surface plate is ready to mount the PS01 or MCD01 presetting clamping devices.

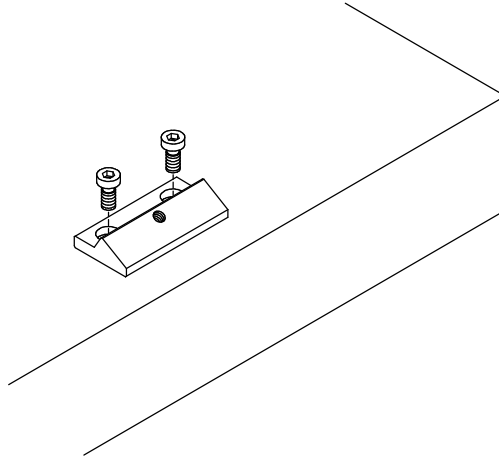


Figure 2

Attaching the PS01 or MCD01 to the Surface Plate

STEP 1. The 18x24 inch surface plate is furnished with inserts installed for a 75mm rail and is attached in “Section 4: Attaching the rail to the surface plate” as shown in Fig. 1. Make certain the rail, the surface plate next to the rail, the bottom face and the inside locating surface of the PS01 or MCD01 are clean.

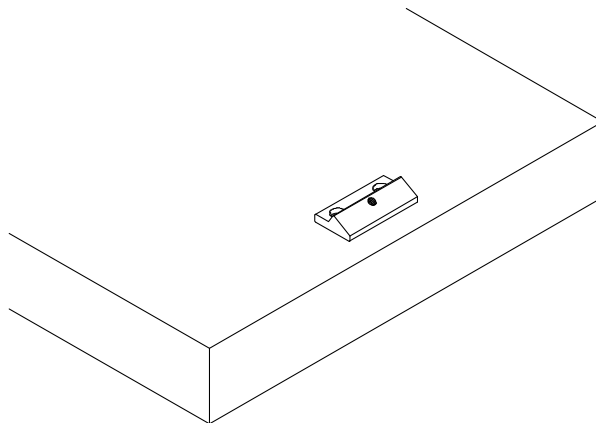


Figure 1

STEP 2. Place the PS01 onto the rail as shown in Fig. 2.

STEP 3. (A). Apply silicone grease to the 8mm Hold Down Screw and insert it into the slot of the PS01. **(B).** Using the 6mm hex key wrench, tighten the screw into the thread in the rail. **DO NOT OVER TIGHTEN. 10 Ft. lbs. max.**

NOTE: The PS01 should remain permanently attached to the rail unless the PS01 is to be used in the machine for special set-ups.

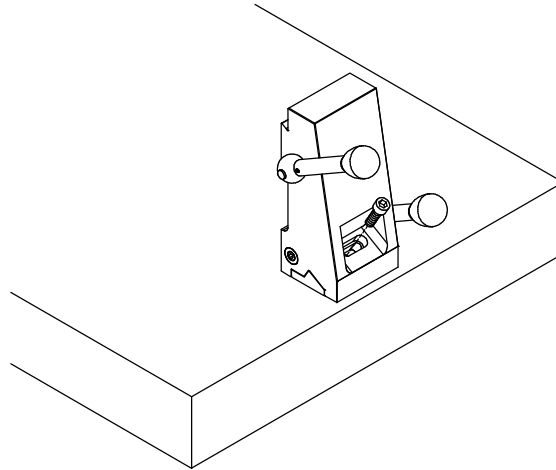


Figure 2

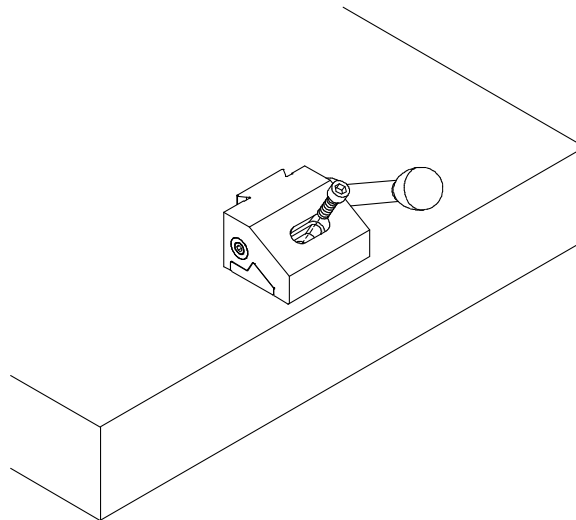


Figure 3

NOTE: If the MCD01 is going to be used as a presetting station then place it onto the rail as shown in Fig. 3.

Attaching the TD01 Truing Device to any Work Holder

STEP 1. EXAMINING THE TD01 ADJUSTMENT SCREWS

The TD01 is shipped with the two adjustment screws assembled as shown in Fig. 1. The screw pads should extend 1/16 inch out from the surface of the TD01.

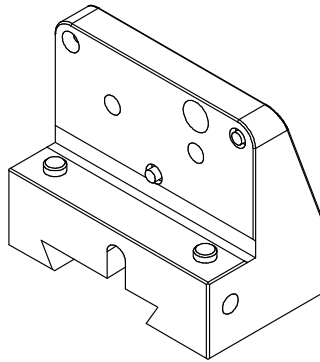


Figure 1

STEP 2. ASSEMBLING THE TD01 AND WORK PIECE HOLDER

Attach the TD01 truing device upside down onto the MCD01 or PS01 as shown in Fig. 2.

NOTE: The TD01 could alternatively be held in the palm of the hand.

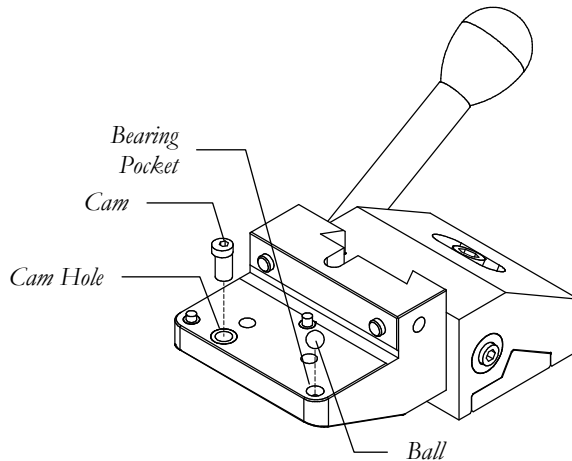


Figure 2

STEP 3. (A). Apply ample silicone grease on the cam and insert it into the cam hole. **(B).** Apply silicone grease on the stainless steel ball bearing and place it in the countersunk pocket. **(C).** Apply silicone grease to ceramic pads on the work piece holder.

STEP 4. PREPARING THE CLAMP SCREWS. Insert each clamp screw into three Belleville springs back-to-back, front-to-front, properly as shown as shown in Fig 3.

STEP 5. Place the work holder, in this case a V06 six inch vise, over the matching holes of the TD01 and allow the cam and ball bearing to seat into place as shown in Fig. 3.

STEP 6. (A). Steady the work holder with a free hand. **(B).** Insert the clamp screws into their respective holes in the work holder. **(C).** Turn the screws in with the hex driver until they bottom out. **(D).** Turn the screws in with the hex driver until they bottom out. **(E).** Then reverse each screw 1/4 turn. The proper spring pressure for truing is now achieved.

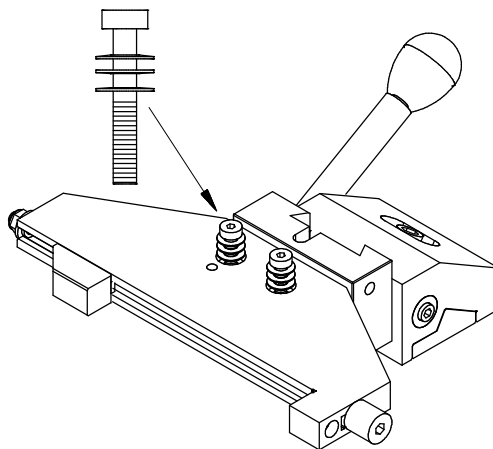


Figure 3

STEP 7. Remove the V06/TD01 assembly from the presetting station.

Truing the V06 Vise on the Truing Station

STEP 1. ATTACHING THE WORK HOLDER TO THE PRESETTING STATION

For the first time truing of any of the Gaiser work piece holders, it is advisable to true the holder without a work piece connected. Also, any time when truing of the work piece is difficult, then true the work piece holder separately.

STEP 2. Insert the TD01/V06 assembly onto the MCD01 or PS01 (lower stage) on the rail as shown in Fig. 1.

ALWAYS TRUE THE FIRST-AXIS BEFORE TRUING THE SECOND-AXIS OR THIRD-AXIS.

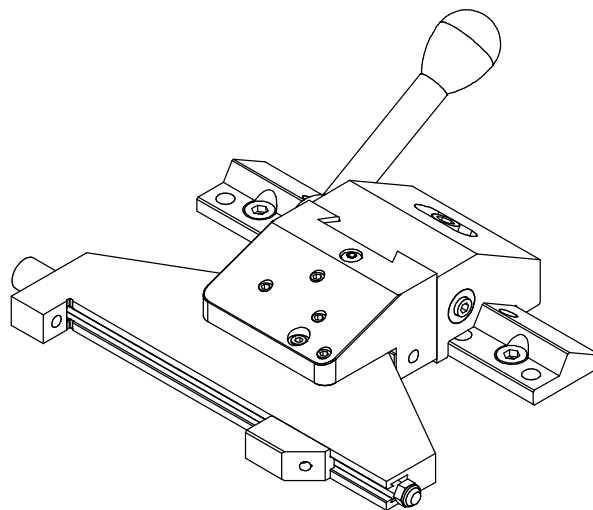


Figure 1

STEP 3. Push down on the torque handle until it clicks. **DO NOT OVER TIGHTEN.**

GENERAL THEORY

THE GAISER THREE POINT TRUING DEVICE (PATENT PENDING)

- A) The truing device contains a pivot ball and two jackscrews that provide a stable three - point suspension.
- B) The ball bearing, the #2 jackscrew and #1 screw form a 90° right triangle as shown in Fig. 2.
- C) Two clamp screws are located inside the triangle to secure the two bodies together.

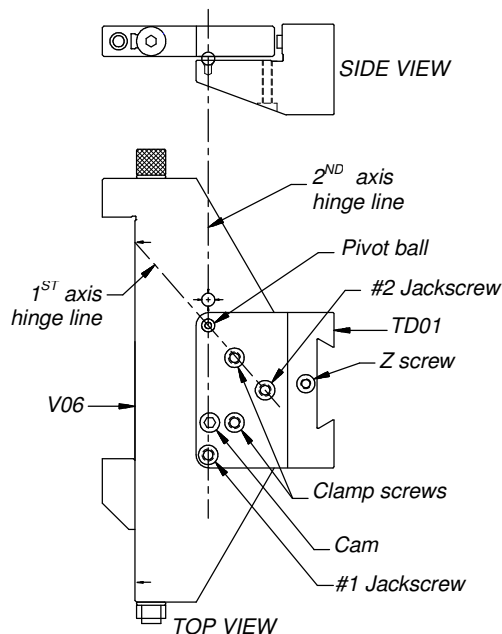


Figure 2

- D) The first-axis hinge line is located along a line of the leg of the triangle formed by the ball bearing and the #2 jackscrew.
- E) Therefore, when the #1 screw is adjusted, the work piece holder will hinge along this line.
- F) However, adjustment of the first-axis will affect the horizontal position of the second-axis and third-axis.
- G) The second-axis hinge line is located along a line of the leg of the triangle formed by the ball bearing and the #1 jackscrew.
- H) Therefore, when the #2 jackscrew is adjusted, the work piece holder will hinge along this line.
- I) When a dial indicator ball is positioned along the first-axis hinge line and the #1 jackscrew is adjusted, there will be no significant change in the indicator reading.
- J) Likewise, when the dial indicator ball is positioned along the second-axis hinge line and the #2 jackscrew is adjusted, there will be no significant change in the indicator reading.

STEP 4. TRUING THE FIRST-AXIS OR X-AXIS

Loosen the two clamp screws 1/4 turn. ***If the clamp screws are too tight to turn, then loosen the two jackscrews first.***

STEP 5. (A). Place the indicator ball on the vise next to the vise bed about 1/2" from the fixed jaw, which is on the 1st-axis hinge line, as shown in Fig. 3. **(B).** Zero the indicator. **(C).** Move the dial indicator toward the other end of the vise bed as shown in Fig. 3.

NOTE: Keep the indicator ball within 1/8 inch from the vise bed.

STEP 6. Turn the jackscrew #1 as shown in Fig. 3 until the indicator moves back to zero. The first-axis is true within .0002 inch.

NOTE: Turning the screw clockwise will lower the sliding jaw end. Turning the screw counter clockwise will raise this end. If more adjustment distance is required and the clamping screws are bottomed out, then loosen clamp screw #1 by turning 1/4 turn clockwise.

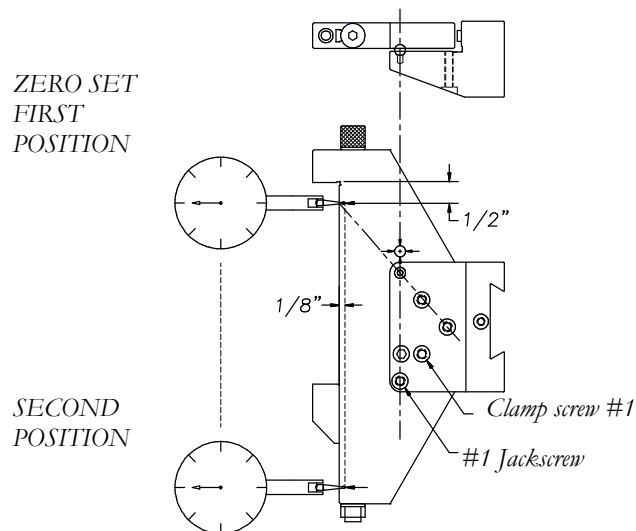


Figure 3

STEP 7. TRUING THE SECOND-AXIS OR Y-AXIS

(A). After the vise is trued in the first-axis then place the indicator ball on the V06 on the second-axis hinge line as shown in Fig. 4. **(B).** Zero the indicator. **(C).** Slide the indicator ball in the third-axis to within 1/8" of the vise bed as shown in Fig. 4.

NOTE: If the vise bed is low then turn the jackscrew #2 clockwise. Likewise, if the vise bed is high then turn the screw counterclockwise.

NOTE: Again, if there is not enough screw travel then loosen the clamp screws 1/4 turn clockwise.

The vise is now true to the surface plate and the EDM machine table.

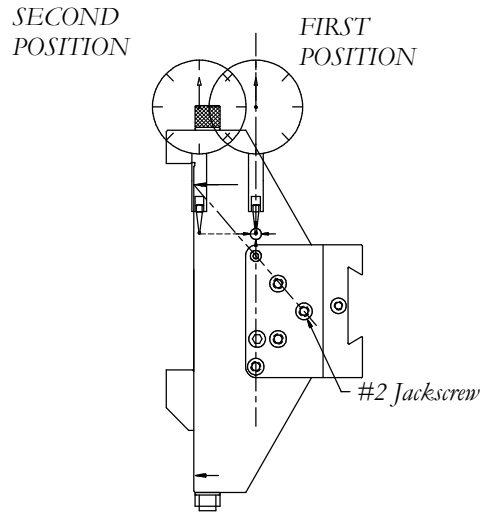


Figure 4

STEP 8. TRUING THE THIRD-AXIS OR ROTATIONAL AXIS

Loosen the TD01 by moving the torque handle upward. Remove the V06/TD01 and work piece off the MCD01 or PS01 and set back on the surface plate as shown in Fig. 5.

STEP 9. (A). Place the indicator ball on the vise bed directly overhead of the pivot ball in the TD01 as shown in Fig. 5. **(B).** Zero the indicator. **(C).** Move the indicator ball to the end of the vise bed near the fixed jaw. **(D).** Adjust the cam until the indicator reads zero. If the cam is too tight to turn then loosen the two clamp screws 1/4 turn. If the clamp screws are too tight, then loosen the two jackscrews 1/8 turn. If it was necessary to loosen the jackscrews then true the 1st and 2nd axes again. The third-axis is trued.

STEP 10. Tighten the clamp screws and check the vise again.

NOTE: A combination of securing the clamp screws and the adjustment screws assures the final truing of the work piece. Once the truing device is secured, it will remain stable and not require additional adjustments.

THE REPLACEABLE FIXED JAW IS DESIGNED TO ATTACH TO THE FIXED JAW WITH A SINGLE SCREW.

STEP 11. Place the replaceable fixed jaw in the vise bed with the hole facing the fixed jaw as shown in Fig. 6, and insert the screw through the fixed jaw into the replaceable jaw. Secure the jaw by tightening the screw.

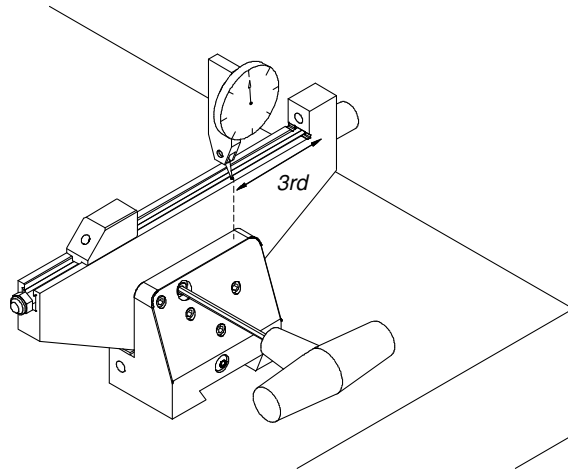


Figure 5

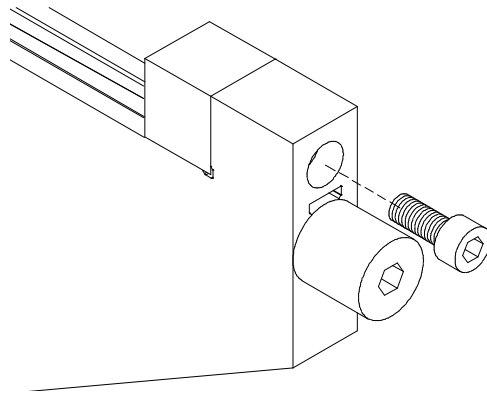
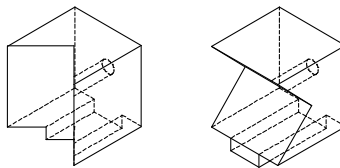


Figure 6

A vertical vee shape will allow the holding of a round part in the vertical axis as shown in Fig. 7.

The replaceable jaw can be cut to any shape. A horizontal vee shape will allow the holding of a round part in the horizontal axis.

Figure 7



Truing the V08 Vise on the Truing Station

Diagrams shown in this section are of the V06. This section is identical to Section 7 in regards to the process. The items numbers are the only changes.

STEP 1. ATTACHING THE WORK HOLDER TO THE PRESETTING STATION

For the first time truing of any of the Gaiser work piece holders, it is advisable to true the holder without a work piece connected. Also, any time when truing of the work piece is difficult, then true the work piece holder only.

STEP 2. Insert the TD02/V08 assembly onto the MCD01 or PS01 (lower stage) on the truing station as shown in Fig. 1.

ALWAYS TRUE THE FIRST-AXIS BEFORE TRUING THE SECOND-AXIS OR THIRD-AXIS.

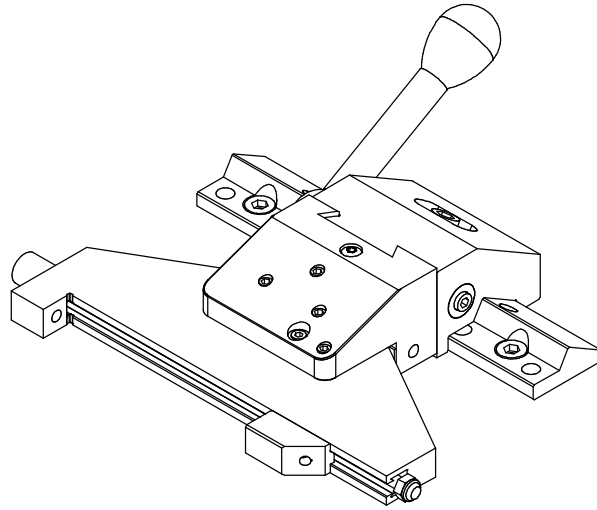


Figure 1

STEP 3. Push down on the torque handle until it clicks. **DO NOT OVER TIGHTEN.**

GENERAL THEORY

THE GAISER THREE POINT TRUING DEVICE (PATENT PENDING)

- A) The truing device contains a pivot ball and two jackscrews that provide a stable three-point suspension.
- B) The ball bearing, the #2 jackscrew and #1 screw form a 90° right triangle as shown in Fig. 2.
- C) Two clamp screws are located inside the triangle to secure the two bodies together.

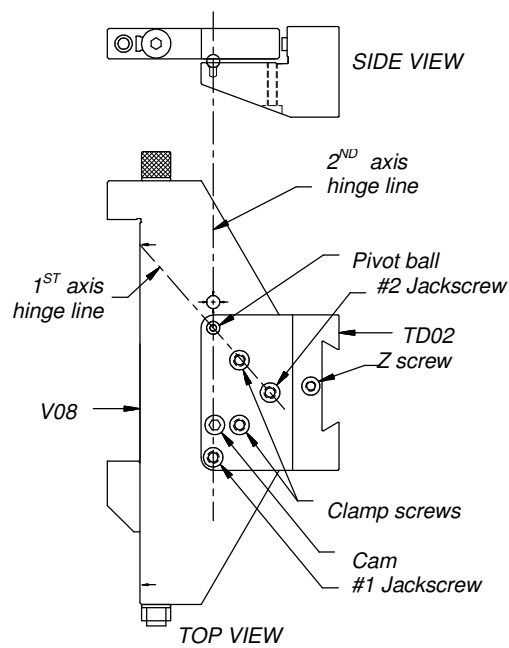


Figure 2

- D) The first-axis hinge line is located along a line of the leg of the triangle formed by the ball bearing and the #2 jackscrew.
- E) Therefore, when the #1 screw is adjusted, the work piece holder will hinge along this line.
- F) However, adjustment of the first-axis will affect the horizontal position of the second-axis and third-axis.
- G) The second-axis hinge line is located along a line of the leg of the triangle formed by the ball bearing and the #1 jackscrew.
- H) Therefore, when the #2 jackscrew is adjusted, the work piece holder will hinge along this line.
- I) When a dial indicator ball is positioned along the first-axis hinge line and the #1 jackscrew is adjusted, there will be no significant change in the indicator reading.
- J) Likewise, when the dial indicator ball is positioned along the second-axis hinge line and the #2 jackscrew is adjusted, there will be no significant change in the indicator reading.

STEP 4. TRUING THE FIRST-AXIS OR X-AXIS

Loosen the two clamp screws 1/4 turn. ***If the clamp screws are too tight to turn, then loosen the two jackscrews first.***

STEP 5. (A). Place the indicator ball on the vise next to the vise bed about 1/2" from the fixed jaw, which is on the 1st-axis hinge line, as shown in Fig. 3. **(B).** Zero the indicator. **(C).** Move the dial indicator toward the other end of the vise bed as shown in Fig. 3.

NOTE: *Keep the indicator ball within 1/8 inch from the vise bed.*

STEP 6. Turn the jackscrew #1 as shown in Fig. 3 until the indicator moves back to zero. The first-axis is true within .0002 inch.

NOTE: *Turning the screw clockwise will lower the sliding jaw end. Turning the screw counter clockwise will raise this end. If more adjustment distance is required and the clamping screws are bottomed out, then loosen clamp screw #1 by turning 1/4 turn clockwise.*

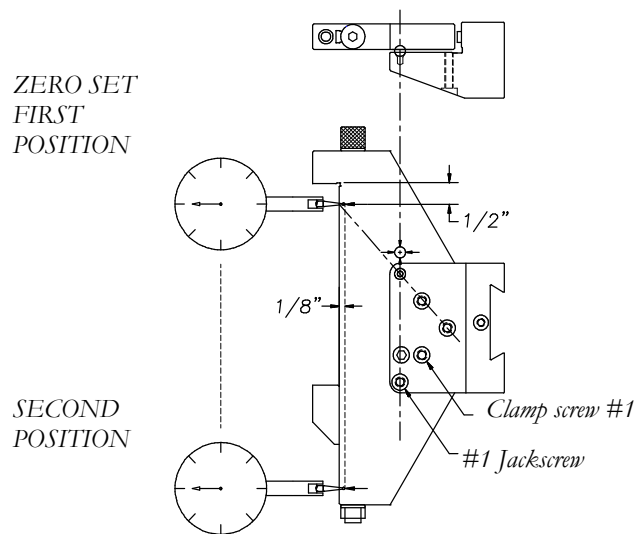


Figure 3

STEP 7. TRUING THE SECOND-AXIS OR Y-AXIS

(A). After the vise is trued in the first-axis then place the indicator ball on the V08 on the second-axis hinge line as shown in Fig. 4. **(B).** Zero the indicator. **(C).** Slide the indicator ball in the third-axis to within 1/8" of the vise bed as shown in Fig. 4.

NOTE: If the vise bed is low then turn the jackscrew #2 clockwise. Likewise, if the vise bed is high then turn the screw counterclockwise.

NOTE: Again, if there is not enough screw travel then loosen the clamp screws 1/4 turn clockwise.

The vise is now true to the surface plate and the EDM machine table.

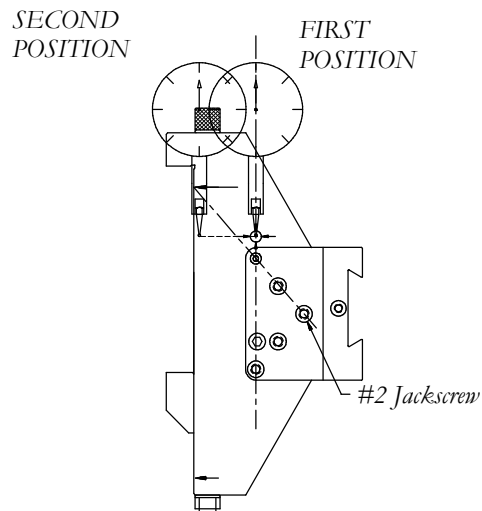


Figure 4

STEP 8. TRUING THE THIRD-AXIS OR ROTATIONAL AXIS

Loosen the TD02 by moving the torque handle upward. Remove the V08/TD02 and work piece off the MCD01 or PS01 and set the TD02 back on the surface plate as shown in Fig. 5.

STEP 9. (A). Place the indicator ball on the vise bed directly overhead of the pivot ball in the TD01 as shown in Fig. 5. **(B).** Zero the indicator. **(C).** Move the indicator ball to the end of the vise bed near the fixed jaw. **(D).** Adjust the cam until the indicator reads zero. If the cam is too tight to turn then loosen the two clamp screws 1/4 turn. If the clamp screws are too tight, then loosen the two jackscrews 1/8 turn. If it was necessary to loosen the jackscrews then true the 1st and 2nd axes again. The third-axis is trued.

STEP 10. Tighten the clamp screws and check the vise again.

NOTE: A combination of securing the clamp screws and the adjustment screws assures the final truing of the work piece. Once the truing device is secured, it will remain stable and not require additional adjustments.

THE REPLACEABLE FIXED JAW IS DESIGNED TO ATTACH TO THE FIXED JAW WITH A SINGLE SCREW.

STEP 11. Place the replaceable fixed jaw in the vise bed with the hole facing the fixed jaw as shown in Fig. 6 and insert the screw through the fixed jaw into the replaceable jaw. Secure the jaw by tightening the screw.

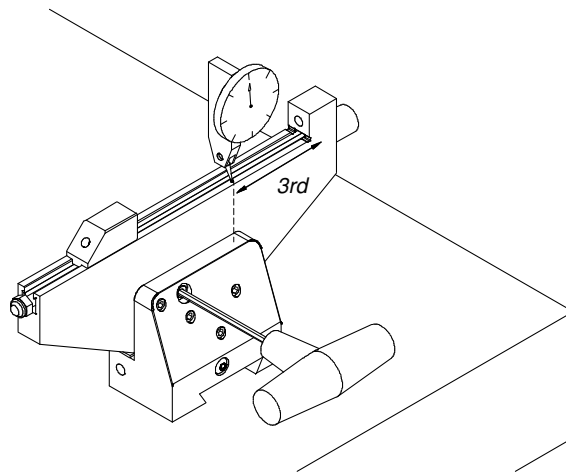


Figure 5

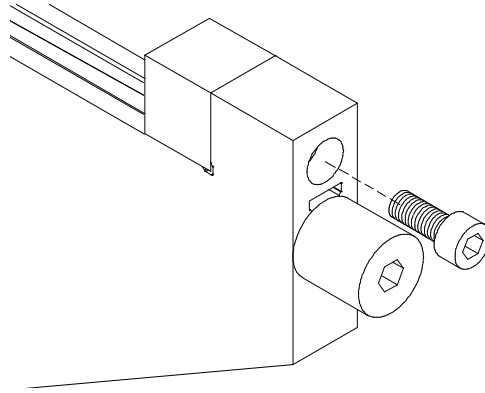


Figure 6

The replaceable jaw can be cut to any shape. A horizontal vee shape will allow the holding of a round part in the horizontal axis.

A vertical vee shape will allow the holding of a round part in the vertical axis as shown in Fig. 7.

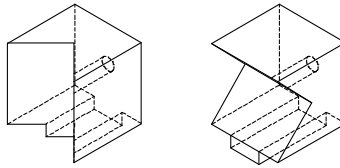


Figure 7

Clamping and truing a work piece with the V06 Vise

STEP 1. CLAMPING THE WORK PIECE (A). Insert the V06/TD01 onto the MCD01 or PS01 presetting station. **(B).** Push the torque handle down slightly with one finger - do not click the handle. Make sure the TD01 is bottomed out on the surface plate. If it is not touching the surface plate then turn the z-axis screw counter clockwise until the TD01 touches the surface plate.

STEP 2. Remove the replaceable fixed jaw from the vise by unscrewing the jaw screw.

STEP 3. Clamp the work piece in the V06 vise using the THW07 hex torque wrench as shown in Fig. 1. Do not use any other hex wrench. **DO NOT OVER TIGHTEN.** The vise knob contains a shear pin that will shear at 1 1/2 times the torque from the THW07 torque wrench. If the shear pin breaks, a spare shear pin can be installed. Contact the factory for any problems.

NOTE: *Explanation of truing device. Refer to previous section "Truing the V06 on the truing station". Always try to hold the work piece from bumping the table when loosening the torque handle. If the work piece hits the surface plate too hard, it can be moved in the vise.*

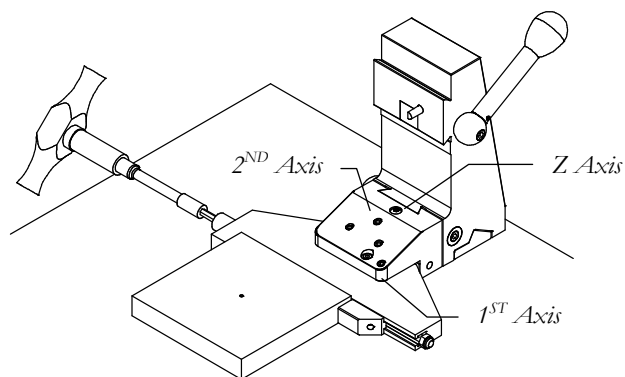


Figure 1

STEP 4. Loosen the TD01 by moving the torque handle upward.

STEP 5. Push the torque handle down only slightly; do not make it click.

STEP 6. Turn the z-axis screw 1/4 clockwise to raise the work piece slightly off the surface plate.

STEP 7. Tighten the MCD01 torque handle until it clicks. *DO NOT OVER TIGHTEN.*

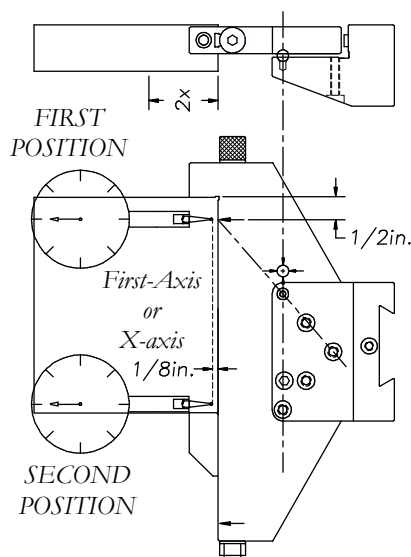


Figure 2

STEP 8. TRUING THE FIRST-AXIS

(A). For easy first-axis truing, locate the indicator ball on the work piece next to the vise bed about 1/2 inch from the fixed jaw face (at the arrow on the vise) as shown in Fig. 2. **(B).** Zero the indicator. **(C).** Move the indicator ball along the work piece, within 1/8 inch adjacent to

the vise bed to the end of the work piece. **(D).** Return to the start position and re-zero the indicator if necessary. **(E).** Move the indicator ball back to the second position. **(F).** Simply adjust the #1 screw until the dial indicator moves back to zero. The work piece is trued in the first-axis to within .0002 inches.

NOTE: If the work piece requires truing then loosen the two clamp screws 1/4 turn.

STEP 9. Tighten the clamp screws slightly.

NOTE: For closer truing, a second pass of the indicator and adjustment of the #1 screw may be required.

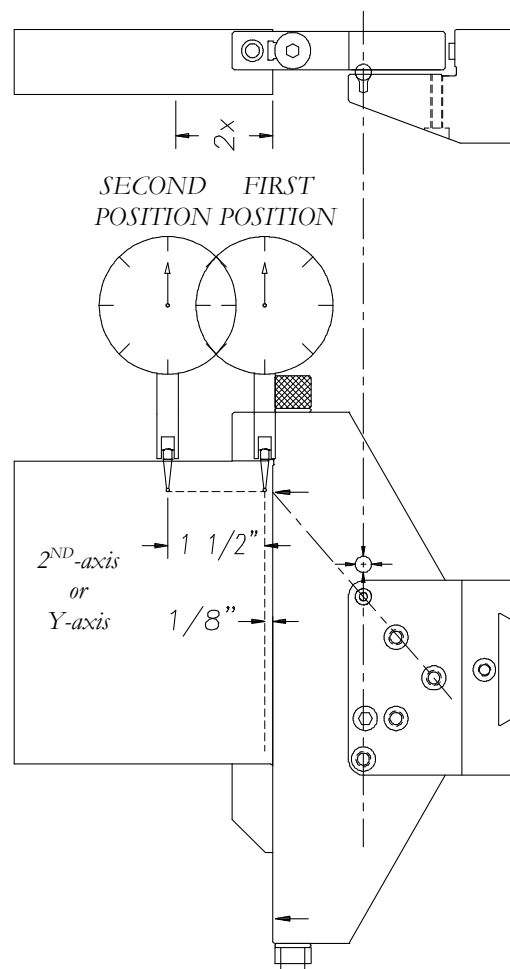


Figure 3

STEP 10. Truing the second-axis (A). Place the indicator ball anywhere along the workpiece within 1/8 inch from the vise bed as shown in Fig. 3. **(B).** Zero the indicator. **(C).** Move the indicator ball outward, perpendicular to the vise bed, in the second-axis to a distance of 1 and 1/2 inches (use a steel ruler). **(D).** Take a reading on the dial indicator and adjust the #2

jackscrew until the reading is zero and continue on past to the same amount as the first reading. In other words, adjust the #2 jackscrew twice the offset reading. **(E).** Move the indicator ball back to the start point and the second axis is trued with .0002 inch.

NOTE: For closer truing a second pass and adjustment may be required.

STEP 11. Truing the work piece third-axis Loosen the TD01 by moving the torque handle upward.

NOTE: Support the work piece with one hand and gently release the torque handle. If the work piece is allowed to bump the surface plate hard enough the work piece can move inside the jaws.

STEP 12. Remove the V06/TD01 and work piece off the MCD01 or PS01 and set back on the surface plate as shown in Fig. 4.

STEP 13. (A). Place the indicator ball on the work piece directly overhead of the pivot ball in the TD01 as shown in Fig. 4. **(B).** Zero the indicator. **(C).** Move the indicator ball to the fixed jaw end. **(D).** Adjust the cam until the indicator reads zero. The third-axis is trued.

STEP 14. Tighten the clamp screws and check the work piece again.

NOTE: A combination of the securing the clamp screws and the jackscrews assures the final truing of the work piece. Once the truing device is secured, it will remain stable and not require additional adjustments.

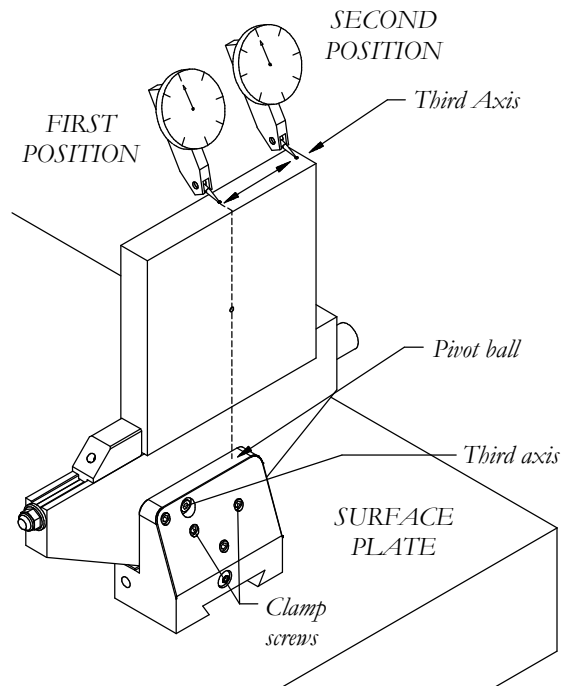


Figure 4

Truing a Work Piece on the PS01

Upper Stage

STEP 1. ATTACHING THE V06/TD01 TO THE PS01

Insert a V06/TD01 unit onto the lower stage of the PS01 as shown in Fig. 1. The lower station on the PS01 is identical to that of the MCD01.

STEP 2. Push down on the torque handle until it clicks. *DO NOT OVER TIGHTEN.*

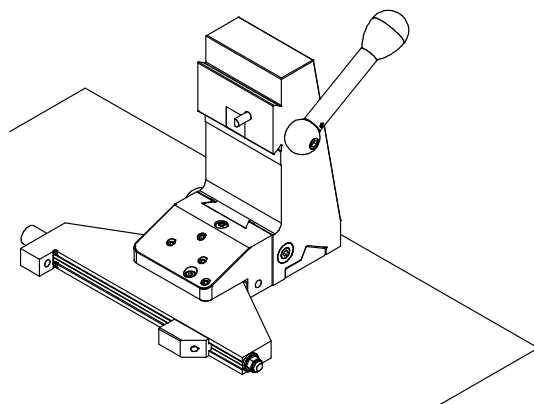


Figure 1

STEP 3. ATTACHING A THIN WORK PIECE ON EDGE.

NOTE: When holding a thin work piece to be wire cut lengthwise on its edge, it is desirable to true the third axis on the larger flat surface. Make sure the replaceable fixed jaw is removed.

Clamp the work piece in the V06 using the torque wrench as shown in Fig. 2. *DO NOT OVER TIGHTEN.*

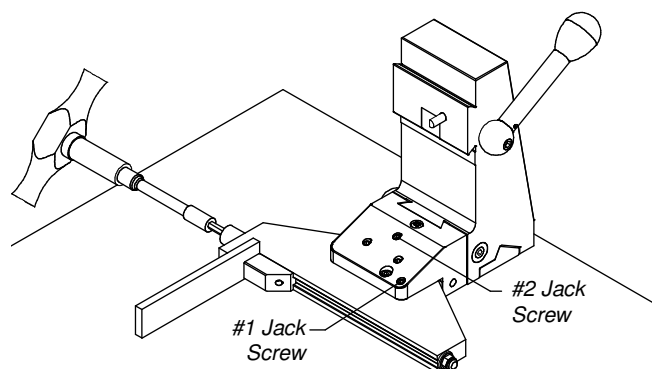


Figure 2

STEP 5. MOVING FROM THE LOWER TO THE UPPER STATION.

Remove the V06/TD01 and work piece from the lower station of the PS01 and insert it onto the horizontal upper station as shown in Fig. 3.

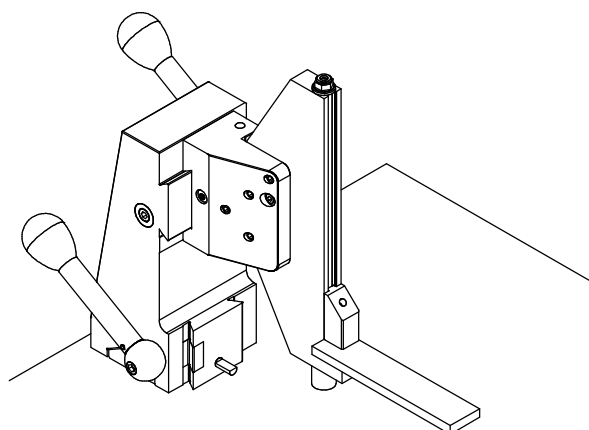


Figure 3

STEP 6. Secure it by pushing down on the upper torque handle until the handle clicks. **DO NOT OVER TIGHTEN.**

STEP 7. TRUING OF THE FIRST-AXIS

NOTE: *The first-axis adjustment affects the second-axis and third-axis positions, therefore, it is best to start with the first-axis. The reason why the upper stage is being used in this case is because the work piece is thin and the wire cut will be on the edge.*

(A). Place the indicator ball on the work piece near one side and next to the jaw as shown Fig. 4. **(B).** Run the indicator across the work piece to near the other side, in the first-axis direction. **(C).** Zero set the indicator on the lowest level, of the two indicator readings.

(D). Move the indicator back to the high side. **(E).** Turn the #1 jackscrew until the indicator reads back to zero. The work piece should be true in the first-axis.

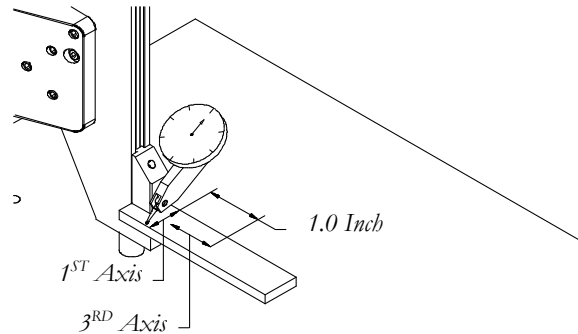


Figure 4

NOTE: If the work piece requires truing, back off the TD01 clamp screws 1/4 turn.

STEP 8. Truing of the third-axis

Place the indicator ball at the same starting position as in STEP 7, shown in Fig. 4.

STEP 9. Using a marking pen and inch scale, make a mark at the starting point and make a second mark one inch out.

STEP 10. Move the indicator out to the second mark and determine which mark is the lowest reading and move the indicator to that point.

STEP 11. (A). Zero the indicator. **(B).** Move to the higher point.

STEP 12. Take that reading and multiply by 2.3 times.

STEP 13. Using the cam, adjust it so the indicator moves back and past zero a total of the calculated amount from above. The third-axis is now trued.

STEP 14. Truing of the second-axis

Remove the V06/TD01 from the upper stage and place it back on the lower stage.

NOTE: Do not let the work piece bottom out on the surface plate.

STEP 15. Hold the unit slightly up off the surface plate to leave clearance for the work piece and then push the torque handle until it clicks.

STEP 16. (A). Place the dial indicator ball on the work piece next to the vise bed as shown in Fig. 5. **(B).** Zero the indicator. **(C).** Move the indicator on the work piece to 1 and 1/2 inches out from the vise bed. **(D).** Check the dial reading. **(E).** Adjust the #2 jackscrew so the indicator comes back to zero and continues on past to the negative amount as the first reading. In other words, adjust the #2 jackscrew two times the indicator reading in the reverse direction. The second-axis should be true.

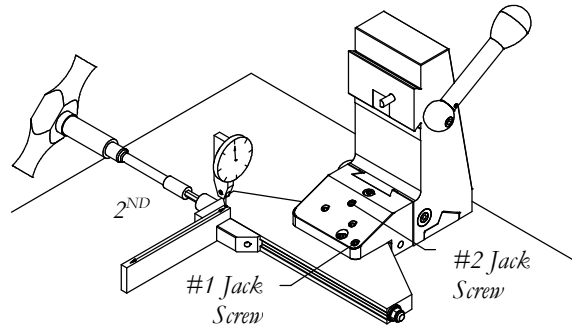


Figure 5

STEP 17. Secure the clamp screws and check all three axis.

Attaching the TD02 Truing Device to any Work Holder

The diagrams in this section are identical to the diagrams in Section 6. The instructions in this section are identical in process. The items are the only changes.

STEP 1. EXAMINING THE TD02 ADJUSTMENT SCREWS

The TD02 is shipped with the two adjustment screws assembled as shown in Fig. 1. The screw pads should extend 1/16 inch out from the surface of the TD02.

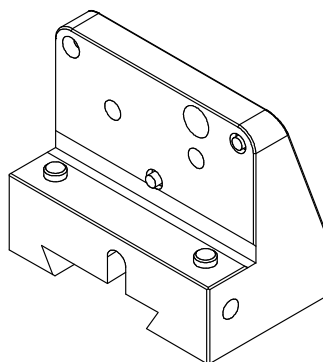


Figure 1

STEP 2. ASSEMBLING THE TD02 AND WORK PIECE HOLDER

Attach the TD02 truing device upside down onto the MCD01 or PS01 as shown in Fig. 2.

NOTE: The TD02 could alternatively be held in the palm of the hand.

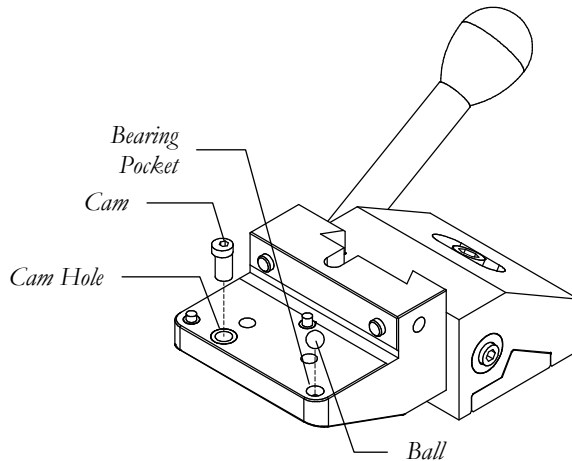


Figure 2

STEP 3. (A). Apply ample silicone grease on the cam and insert it into the cam hole. **(B).** Apply silicone grease on the stainless steel ball bearing and place it in the countersunk pocket. **(C).** Apply silicone grease to ceramic pads on the work piece holder.

STEP 4. PREPARING THE CLAMP SCREWS. Insert each clamp screw into three Belleville springs back-to-back, front-to-front, properly as shown as shown in Fig 3.

STEP 5. Place the work holder, in this case a V06 six inch vise, over the matching holes of the TD01 and allow the cam and ball bearing to seat into place as shown in Fig. 3.

STEP 6. (A). Steady the work holder with a free hand. **(B).** Insert the clamp screws into their respective holes in the work holder. **(C).** Turn the screws in with the hex driver until they bottom out. **(D).** Turn the screws in with the hex driver until they bottom out. **(E).** Then reverse each screw 1/4 turn. The proper spring pressure for truing is now achieved.

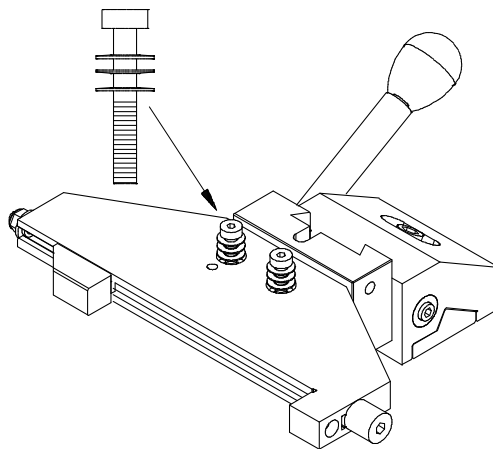


Figure 3

STEP 7. Remove the V06/TD02 assembly from the presetting station.

Clamping and truing a work piece with the V08 Vise

The diagrams in this section are identical to that in Section 9. The instructions are identical in process. The items are the only things that change.

STEP 1. CLAMPING THE WORK PIECE (A). Insert the V08/TD02 onto the MCD01 or PS01 presetting station. **(B).** Push the torque handle down slightly with one finger - do not click the handle. Make sure the TD02 is bottomed out on the surface plate. If it is not touching the surface plate then turn the z-axis screw counter clockwise until the TD02 touches the surface plate.

STEP 2. Remove the replaceable fixed jaw from the vise by unscrewing the jaw screw.

STEP 3. Clamp the work piece in the V06 vise using the THW07 hex torque wrench as shown in Fig. 1. Do not use any other hex wrench. **DO NOT OVER TIGHTEN.** The vise knob contains a shear pin that will shear at 1 1/2 times the torque from the THW07 torque wrench. If the shear pin breaks, a spare shear pin can be installed. Contact the factory for any problems.

NOTE: *Explanation of truing device. Refer to previous section "Truing the V08 on the truing station". Always try to hold the work piece from bumping the table when loosening the torque handle. If the work piece hits the surface plate too hard, it can be moved in the vise.*

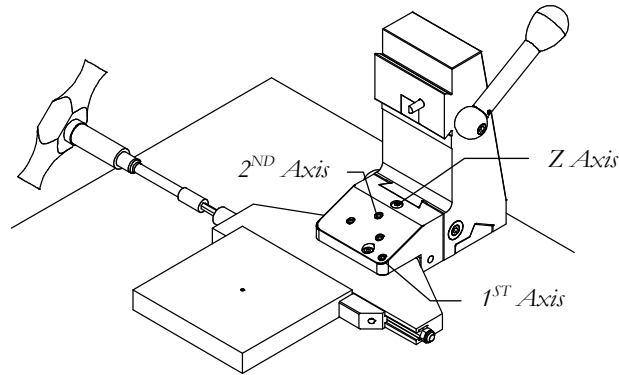


Figure 1

STEP 4. Loosen the TD02 by moving the torque handle upward.

STEP 5. Push the torque handle down only slightly; do not make it click.

STEP 6. Turn the z-axis screw 1/4 clockwise to raise the work piece slightly off the surface plate.

STEP 7. Tighten the MCD01 torque handle until it clicks. *DO NOT OVER TIGHTEN.*

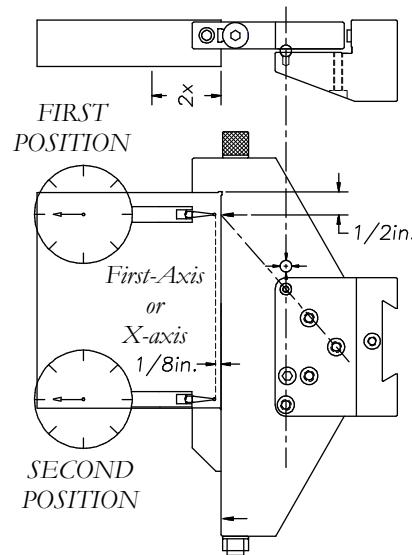


Figure 2

STEP 8. TRUING THE FIRST-AXIS

(A). For easy first-axis truing, locate the indicator ball on the work piece next to the vise bed about 1/2 inch from the fixed jaw face (at the arrow on the vise) as shown in Fig. 2. **(B).** Zero the indicator. **(C).** Move the indicator ball along the work piece, within 1/8 inch

adjacent to the vise bed to the end of the work piece. **(D)**. Return to the start position and re-zero the indicator if necessary. **(E)**. Move the indicator ball back to the second position. **(F)**. Simply adjust the #1 screw until the dial indicator moves back to zero. The work piece is trued in the first-axis to within .0002 inches.

NOTE: If the work piece requires truing then loosen the two clamp screws 1/4 turn.

STEP 9. Tighten the clamp screws slightly.

NOTE: For closer truing, a second pass of the indicator and adjustment of the #1 screw may be required.

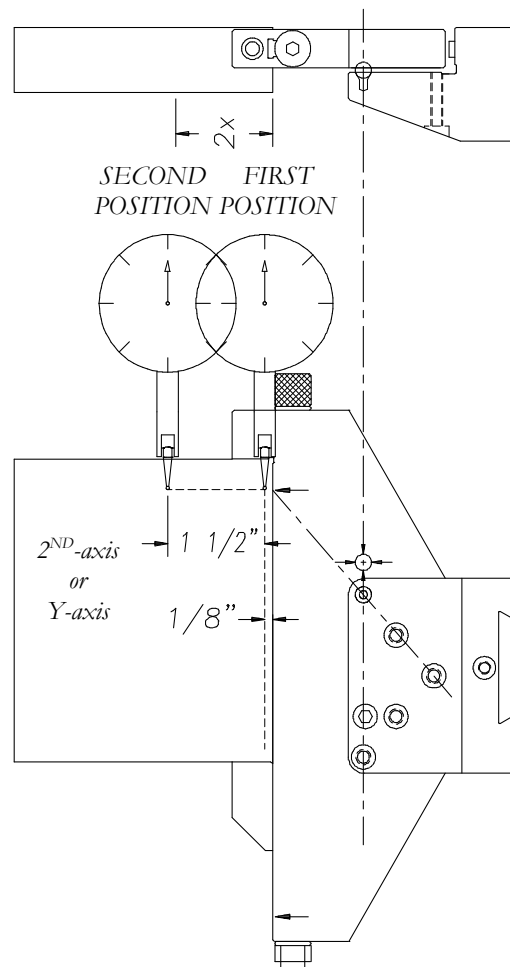


Figure 3

STEP 10. (A). Place the indicator ball anywhere along the workpiece within 1/8 inch from the vise bed as shown in Fig. 3. **(B).** Zero the indicator. **(C).** Move the indicator ball outward, perpendicular to the vise bed, in the second-axis to a distance of 1 and 1/2 inches (use a steel ruler). **(D).** Take a reading on the dial indicator and adjust the #2 jackscrew until the

reading is zero and continue on past to the same amount as the first reading. In other words, adjust the #2 jackscrew twice the offset reading. **(E).** Move the indicator ball back to the start point and the second axis is trued with .0002 inch.

NOTE: For closer truing a second pass and adjustment may be required.

STEP 11. Truing the work piece third-axis Loosen the TD02 by moving the torque handle upward.

NOTE: Support the work piece with one hand and gently release the torque handle. If the work piece is allowed to bump the surface plate hard enough the work piece can move inside the jaws.

STEP 12. Remove the V08/TD21 and work piece off the MCD01 or PS01 and set back on the surface plate as shown in Fig. 4.

STEP 13. (A). Place the indicator ball on the work piece directly overhead of the pivot ball in the TD01 as shown in Fig. 4. **(B).** Zero the indicator. **(C).** Move the indicator ball to the fixed jaw end. **(D).** Adjust the cam until the indicator reads zero. The third-axis is trued.

STEP 14. Tighten the clamp screws and check the work piece again.

NOTE: A combination of the securing the clamp screws and the jackscrews assures the final truing of the work piece. Once the truing device is secured, it will remain stable and not require additional adjustments.

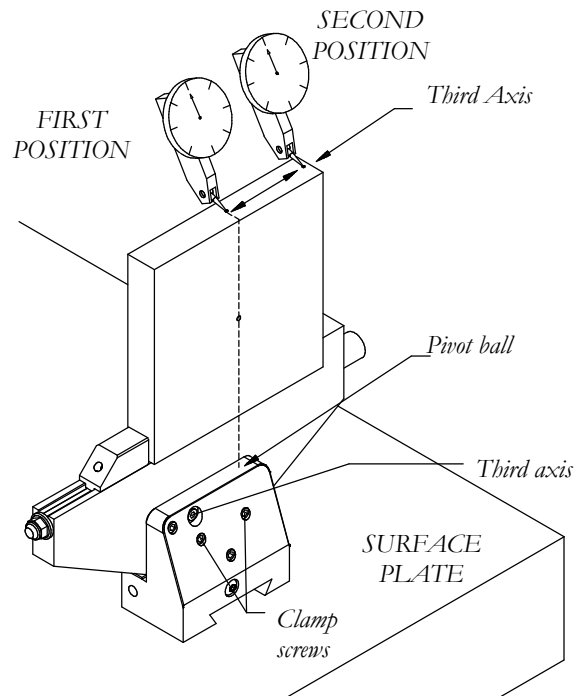


Figure 4

Using the VV01/VV03 Vertical Vise

STEP 1. ATTACHING THE VERTICAL VISE TO A TD01

The vertical vise attaches to a TD01 as described in "Instructions: Attaching the TD01 truing device to any work piece holder."

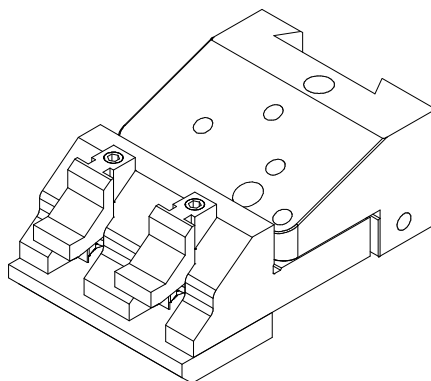


Figure 1

NOTE: The vertical vise has two independent sliding jaws for clamping work pieces. The jaws can be used together or individually. The VV01 is equipped with two sets of jaws. The first set has a clamping range of 0.0 to 0.5 inches as shown in Fig. 2. The lead screws are left hand threads, therefore clockwise tightens. With the 0.0 to 0.5 jaws a thin flat work piece can be held as shown in Fig. 3.

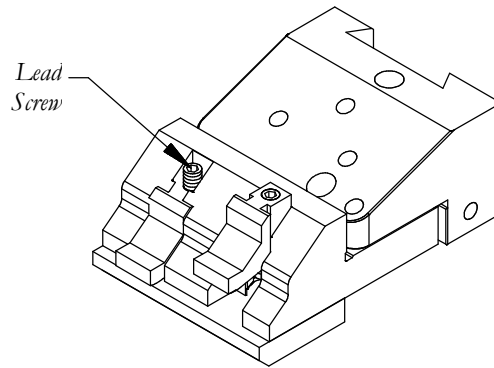


Figure 2

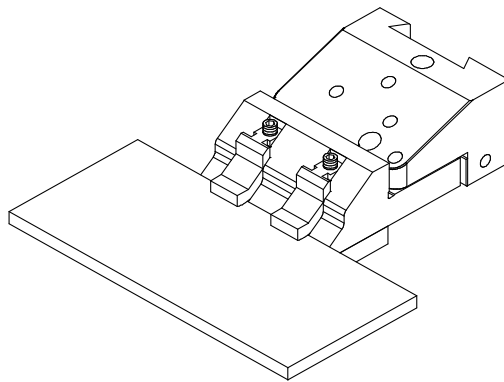


Figure 3

NOTE: By exchanging with the second set of jaws the VV01 has a range of 0.5 to 1.0 inches as shown in Fig. 4. The VV03 has only one set of jaws that can be reversed to cover the three-inch range of the vise.

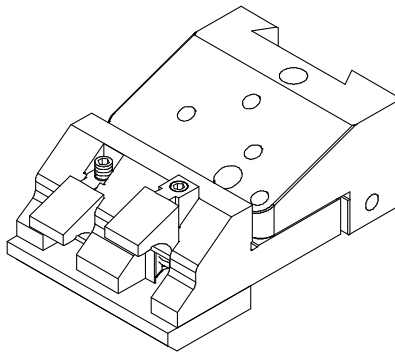


Figure 4

The bottom plate is also adjustable outward for added support when clamping a larger work piece as shown in Fig. 5. The maximum recommended work piece weight is 20 lb. Six screws hold the bottom plate.

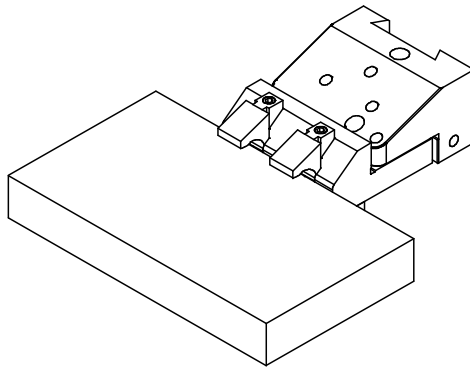


Figure 5

STEP 2. TRUING THE FIRST-AXIS OF THE VERTICAL VISE

(A). Place the vertical vise/TD01 on the MCD01 or PS01 presetting station without using the torque handle. **(B).** Using one hand, hold the vertical vise/TD01 slightly off the surface plate while tightening the torque handle. Do not raise the TD01 beyond its upper contact pad. Part of the upper contact pad must be against the MCD01.

NOTE: The bottom plate of the vertical vise will collide with the lower flush cup unless the soft stops on the machine are set or the vise is adjusted up for flush cup clearance.

The bottom plate should not be touching the surface plate as shown in Fig. 6. Truing of the work piece can now be done.

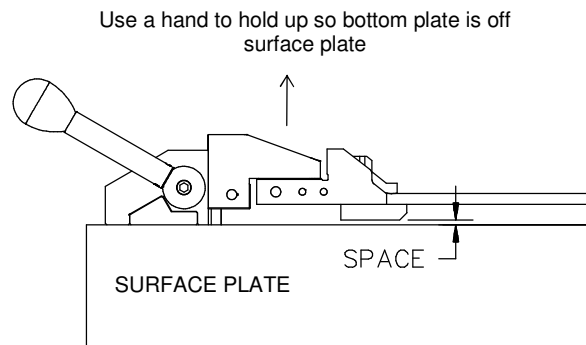


Figure 6

STEP 4. Loosen the two clamp screws 1/4 turn.

STEP 5. (A). Place the indicator ball on the VV01 at the corner nearest the pivot ball of the TD01 as shown in Fig. 7. **(B).** Zero the indicator. **(C).** Move the indicator to the other end of the first-axis on the vertical vise as shown. **(D).** Turn the #1 jackscrew until the indicator returns to the zero set position. The first-axis is trued.

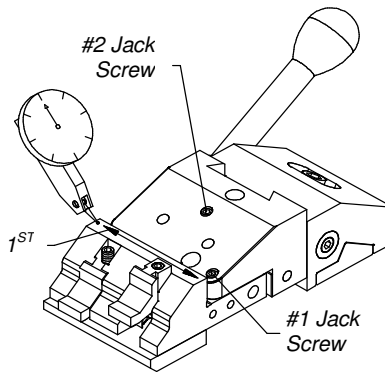


Figure 7

STEP 9. TRUING THE SECOND-AXIS OF THE VERTICAL VISE

(A). Place the indicator ball under the vise below the pivot ball of the TD01 as shown in Fig. 8. **(B).** Zero the indicator. **(C).** Move the indicator ball to the back of the bottom of the vertical vise in the second-axis direction. **(D).** Turn the #2 jackscrew until the indicator returns to the zero set position. The second-axis is trued.

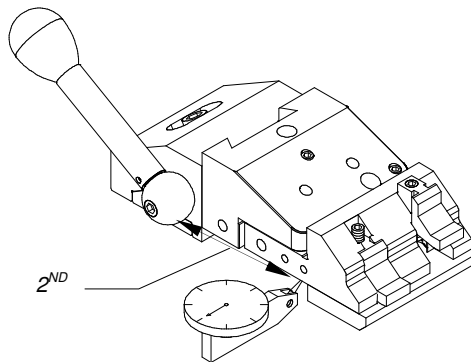


Figure 8

STEP 10. TRUING OF THE THIRD-AXIS OF THE VERTICAL VISE

Remove the vertical vise/TD01 from the presetting station.

STEP 11. Place the vertical vise/TD01 on the surface plate as shown in Fig. 9.

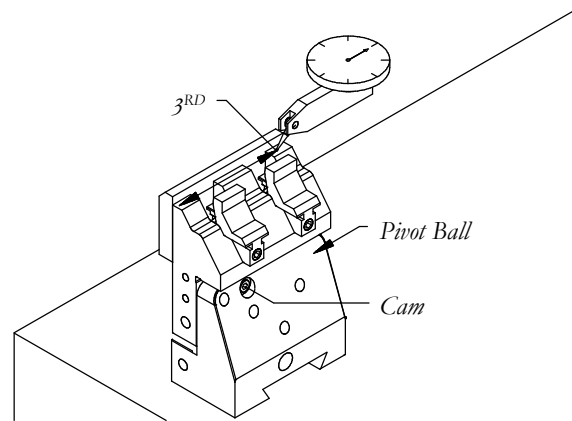


Figure 9

STEP 12. (A). Place the indicator ball on the vertical vise front pad in the middle in-line above the pivot ball of the TD01. **(B).** Zero the indicator. **(C).** Move the indicator ball over to the other front pad at the end of the third-axis. **(D).** Turn the cam until the indicator returns back to the zero set. The third-axis is trued.

STEP 13. Secure the clamp screws and check all three axis again.

NOTE: A combination of tightening the clamp screws and turning the #1 and #2 jackscrews secure the VV01 in a true position.

STEP 14. TRUING THE FIRST-AXIS OF A WORK PIECE

Attach the vertical vise/TD01 with a work piece to a presetting station by holding the TD01 off the plate as shown in Fig. 10.

STEP 15. (A). Assuming the work piece is long and extends beyond the vertical vise, position the indicator ball along an imaginary line made by the #2 jack screw and pivot ball as shown in Fig. 10. **(B).** Zero set the indicator. **(C).** Move the indicator ball to the other end of the work piece along the first-axis. **(D).** Turn the #1 jackscrew until the indicator returns back to zero set. The first-axis is trued.

NOTE: If the first-axis is not true, loosen the two clamp screws 1/4 turn.

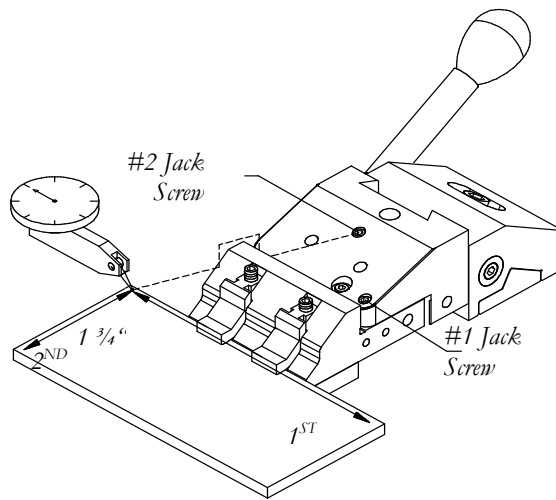


Figure 10

STEP 16. TRUING THE SECOND-AXIS OF A WORK PIECE

(A). Place the indicator ball at the edge of the work piece near the vertical vise front as shown in Fig. 10. **(B).** Zero the indicator. **(C).** Move the indicator ball outward 1 3/4 inch in the second-axis direction. **(D).** Take a reading on the indicator. **(E).** Turn the #2 jackscrew until the indicator returns to the zero set and continue past the same amount as the reading.

NOTE: In other words, turn the #2 screw so the indicator goes 2 times the measured second-axis reading. The second-axis is true.

STEP 17. TRUING THE THIRD-AXIS OF A WORK PIECE

Remove the vertical vise/TD01 with work piece from the presetting station.

STEP 18. Set the assembly on the surface plate as shown in Fig. 11.

STEP 19. (A). Place the indicator ball on the work piece directly above the pivot ball of the TD01. **(B).** Zero the indicator. **(C).** Move the indicator ball to a position along the work piece in the third-axis direction. **(D).** Turn the cam until the indicator reading returns to the zero set position. The third-axis is true.

STEP 20. Secure the clamp screws and check all three axis again.

NOTE: A combination of tightening the clamp screws and turning the #1 and #2 jackscrews secure the vertical vise in a true position.

STEP 21. After the truing is completed remove the vertical vise/TD01 with work piece and place it onto the MCD01 in the machine as shown in Fig. 12.

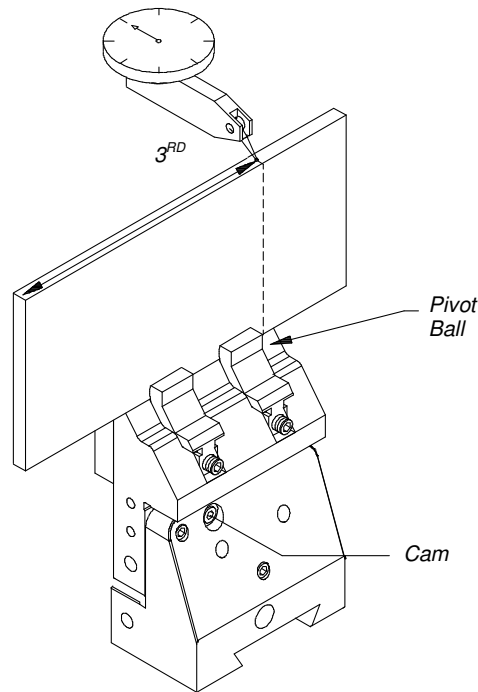


Figure 11

NOTE: The TD01 should be resting on the machine table or rail. The bottom plate is .015 inch below the table zero level and the work piece can collide with the lower flush cup. Therefore, when loading the work piece into the machine make sure the flush cup clears the work piece. Turn the z-axis adjustment screw clockwise to raise the work piece to the correct level above the flush cup.

OPTION: The vertical vises can be preset to the zero level off line with the use of SB01/ SB02 spacer blocks. See page 55, STEP 51.

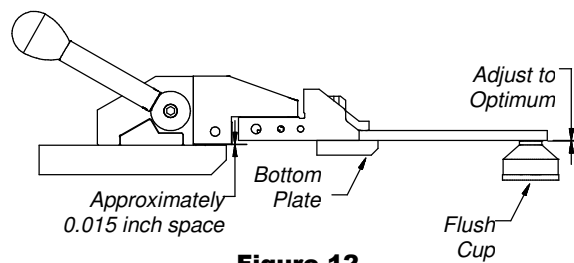


Figure 12

STEP 22. TRUING OF THE WORK PIECE SO THE LOWER FLUSH CUP CLEARS THE BOTTOM PLATE

Place the vertical vise/TD01 on the MCD01 or PS01 presetting station without using the torque handle.

NOTE: The vertical vise bottom plate will be resting on the surface plate.

STEP 23. Using the 3mm hex key wrench turn the z-axis screw clockwise several turns until it starts to raise the vertical vise bottom plate off the surface plate.

NOTE: *Do not raise the TD01 beyond its upper contact pad. Part of the upper contact pad must be against the MCD01.*

STEP 24. Tighten the torque handle and the bottom plate should now be slightly above the surface plate the same as shown in Fig. 6, Page 43. Truing of the work piece can now be done as described above.

STEP 25. After the truing is completed remove the vertical vise/TD01 and work piece from the presetting station and place them onto the MCD01 in the machine and secure by tightening of the torque handle as shown in Fig. 13.

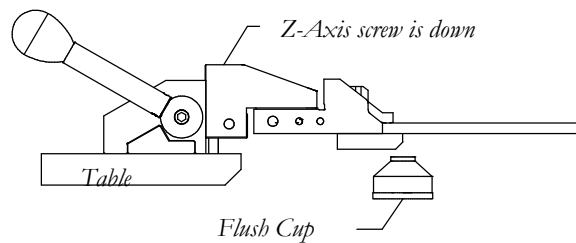


Figure 13

NOTE: *As can be seen the work piece is located above the flush cup because the z-axis screw is keeping the TD01 adjusted high above its normal position.*

NOTE: *The Z-axis screw is mainly used to make any last minute adjustments to keep the work piece or bottom plate from collision with the lower flush cup.*

STEP 26. ADJUSTMENT OF THE BOTTOM PLATE

Remove any work piece from the vertical vise.

STEP 27. Remove the vertical vise from the truing station and loosen all six, bottom plate screws.

STEP 28. Lay the vertical vise only, on the corner of the surface plate as shown in Fig. 14. Do not allow the TD01 to touch the surface plate.

STEP 29. Support the vertical vise on the surface plate by holding the TD01 in one hand and move the bottom plate to the desired position.

STEP 30. Using the hex key wrench secure all six bottom plate screws.

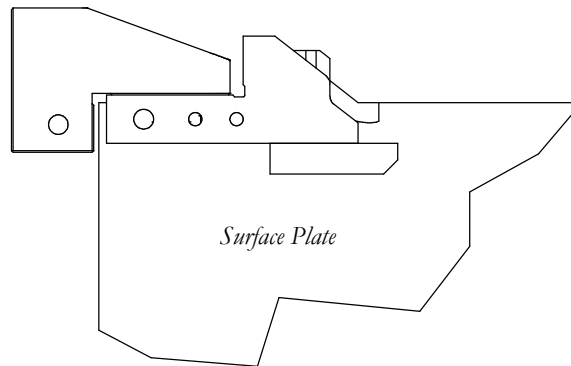


Figure 14

STEP 31. OFF-LINE PRESETTING OF A WORK PIECE TO THE ZERO LEVEL IN THE Z-AXIS

NOTE In order to preset work to the zero level off line, the addition of the SB01 & SB02 spacer blocks are required.

Install the SB01 onto the Granite surface plate. Reattach the R75-50-8M rail and the MCD01 or PS01 presetting device as shown in Fig. 15.

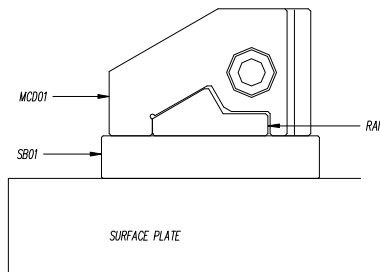


Figure 15

STEP 32. Place the vertical vise/TD01 without the work piece onto the MCD01 or PS01 lower station but do not torque the torque handle down to locking position. . Lower the torque handle until the wedge of the MCD01 or PS01 draws the vertical vise/TD01 snug but not tight as shown in Fig. 16.

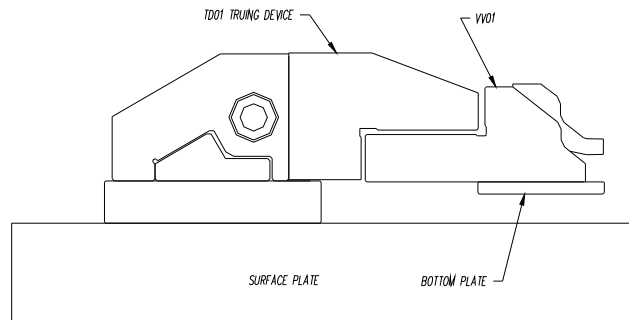


Figure 16

STEP 33. Place the SB02 on the surface plate positioned next to the bottom plate of the vertical vise as shown in Fig. 17.

STEP 34. With the handle still snug, adjust the height of the bottom plate up using the z-axis adjustment screw.

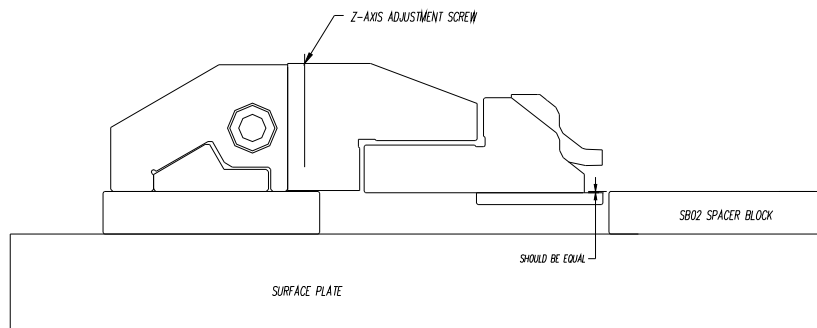


Figure 17

STEP 35. Once the top of the bottom plate is equal to the top of the SB02, lock the vertical vise/TD01 in place by increasing pressure on the torque handle until it “clicks”.

STEP 36. Load the work piece into the vertical vise by placing the work piece onto the SB02 spacer block and sliding it up to the vise bed as shown in Fig. 18.

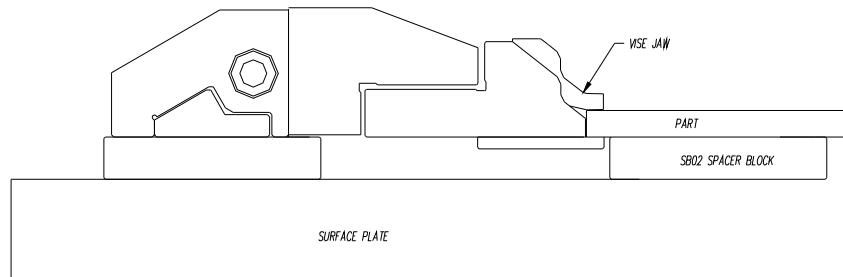


Figure 18

STEP 37. Tighten the vise jaws to secure the work piece and slide the SB02 spacer block out from under the work piece.

NOTE: The torque handle may require to be lifted in order for the SB02 to slide out easily. If this is the case, once the SB02 has been removed and the vertical vise returned to the MCD01 or PS01 lower station, confirm that the height of the work piece allows for the SB02 to still just slide under the work piece. If the SB02 will not slide under the work piece, repeat STEP 56.

STEP 38. True the work piece by following STEPS 14-19.

STEP 39. Check the height of the work piece again by sliding the SB02 under the work piece. You should just be able to have the SB02 fit under the work piece. Adjust as needed.

STEP 40. After all adjustments are completed, remove the vertical vise/TD01 and work piece and place them onto the MCD01 in the machine as shown in Fig. 19.

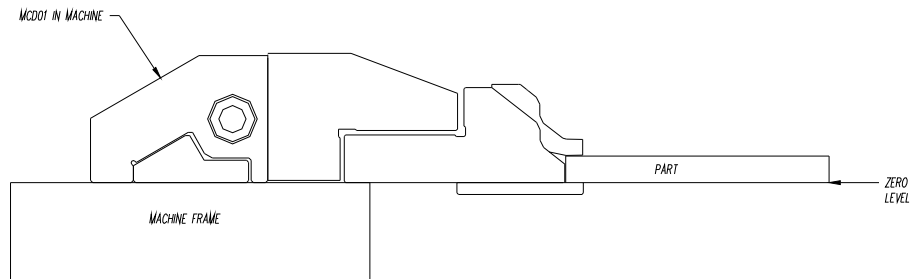


Figure 19

TROUBLESHOOTING:

The sliding jaw locks to the lead screw. **DO NOT FORCE THE LEAD SCREW IF IT BECOMES LOCKED.** Remove the six screws in the bottom plate. Remove the bottom plate. The jaw with lead screw can be easily slid out the bottom of the vise.

If the lead screw and jaw cannot be easily separated then contact the factory for a replacement.

Using the AP01 Angle Plate

STEP 1. The AP01 attaches to a TD01 as described in the Section 6 Instructions: Attaching the TD01 truing device to any work piece holder.”

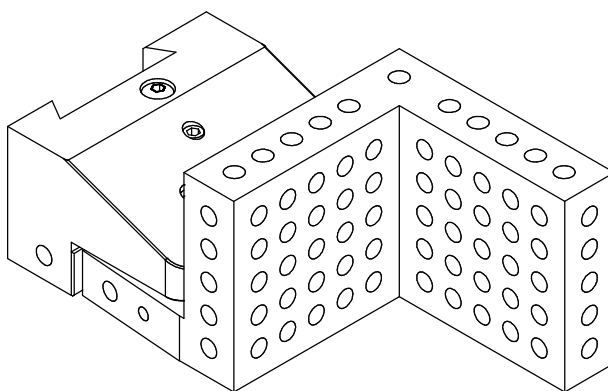


Figure 1

NOTE: The AP01 is a multi-sided angle plate with a versatile array of threaded holes on all sides. Parts may be clamped in any position desired. Large cylindrical pieces can be accurately held. An assorted set of clamps and screws is included with the AP01. Maximum recommended work piece weight is 20 lb.

STEP 2. TRUING THE FIRST-AXIS

Attach the AP01/TD01 to a truing station as shown in Fig. 2.

STEP 3. (A). Loosen the two clamp screws on the TD01 1/4 turn. **(B).** Place the indicator ball on the corner of the AP01 as shown in Fig. 2. **(C).** Zero the indicator. **(D).** Move the indicator ball to the other end of the AP01 surface. **(E).** Turn the #1 jackscrew on the TD01 until the indicator returns back to the zero set. The first-axis is trued.

NOTE: Try to keep the indicator ball the same distance from the edge of the surface.

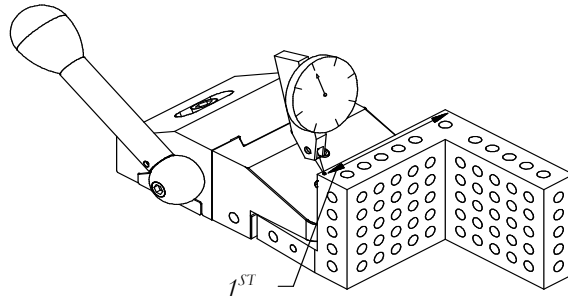


Figure 2

STEP 4. TRUING THE SECOND-AXIS

(A). Place the indicator ball at the corner of the AP01 as shown in Fig. 3. **(B).** Zero the indicator. **(C).** Move the indicator ball to the other end of the AP01 in the second-axis. **(D).** Turn the #2 jackscrew on the TD01 until the indicator returns back to the zero set. **(E).** Repeat this step once again. The second-axis is trued.

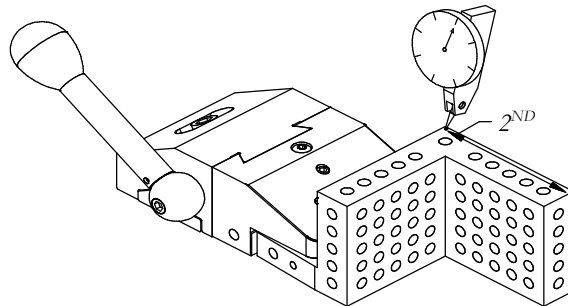


Figure 3

STEP 5. TRUING OF THE THIRD-AXIS Remove the AP01/TD01 from the truing station and set it on the surface plate as shown in Fig. 4.

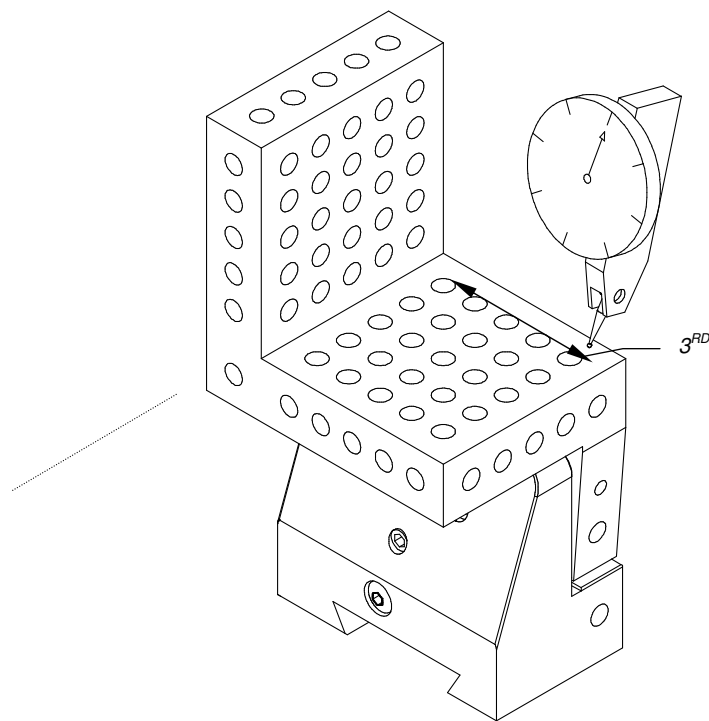


Figure 4

STEP 6. (A). Place the indicator ball on the AP01 in-line with the first row of holes as shown in Fig. 4. **(B).** Zero the indicator. **(C).** Move the indicator ball to the other end of the third-axis. **(D).** Turn the cam on the TD01 until the indicator returns to the zero set. The third-axis is true.

NOTE: This location is directly above the pivot ball on the TD01.

STEP 7. Secure the two clamp screws and re-check all three axis.

Applications:

A round work piece may be clamped as shown in Fig. 5. The round work piece will be aligned perfectly in the corner of the AP01.

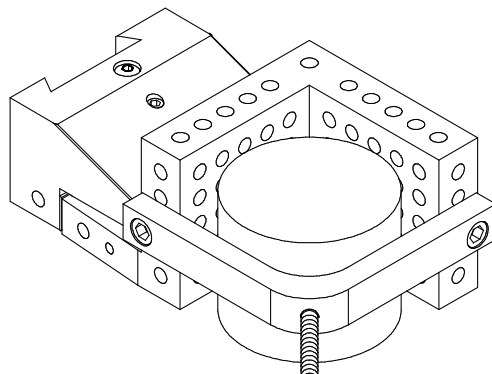


Figure 5

The toe clamps will hold a work piece to the side of the AP01 as shown in Fig. 6.

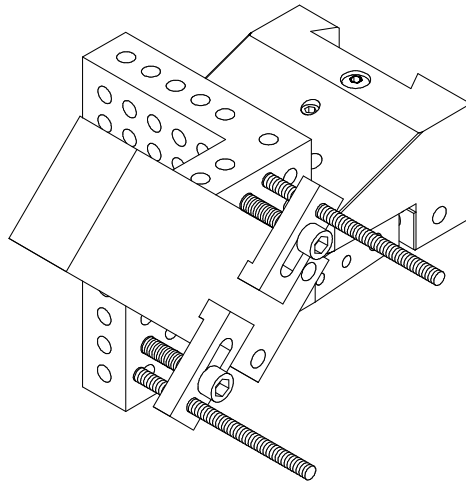


Figure 6

The in-hole clamps are used to hold a work piece against the inside surface of the AP01 as shown Fig. 7.

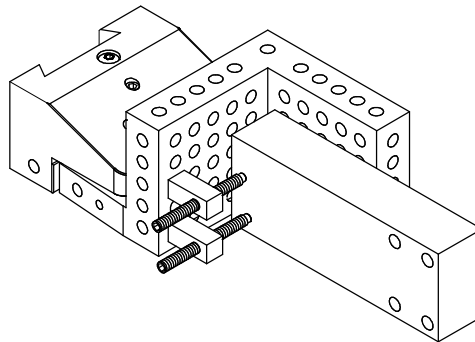


Figure 7

Using the RC01 Round Clamp

STEP 1. The RC01 attaches to the TD01 as described in the Instructions for attaching a work piece holder to a TD01 section.

NOTE: *The round clamp is equipped with six spacer/stand-offs and a clamp bar.*

STEP 2. Insert the RC01/TD01 combination onto the presetting truing station.

STEP 3. Turn the z-axis screw clockwise until the TD01 is slightly off the surface plate.

STEP 4. Secure it by pushing the torque handle until it clicks.

STEP 5. True the first axis (x-axis) by placing the indicator ball on the mark at the right end of the body in line with the pivot ball and #2 jack screw as shown in Fig. 1, point A.

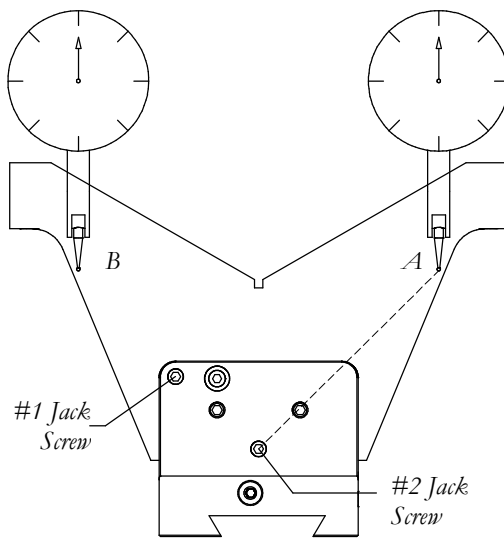


Figure 1

STEP 6. Back off the two clamp screws about 1/4 turn.

STEP 7. (A). Zero the indicator. **(B).** Move the indicator to the other mark on the other side of the body as shown in Fig. 1, point B. **(C).** Turn the #1 jackscrew until the indicator returns back to zero. (The first axis is now true.)

STEP 8. (A). Place the indicator ball next to the pivot ball as shown in Fig. 2, point A. **(B).** Zero the indicator. **(C).** Move the indicator out 1 1/8 inch to the second mark as shown in Fig. 2, point B. **(D).** Turn the #2 jackscrew until the indicator moves back to the zero reading. (The second axis is now true).

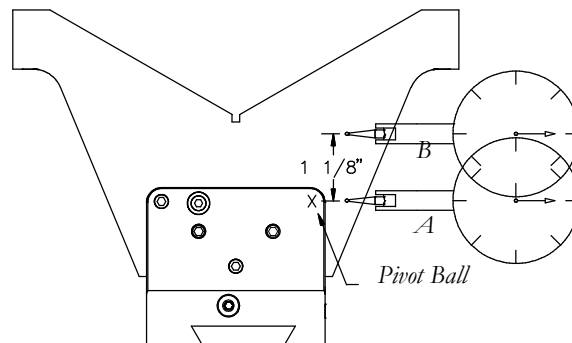


Figure 2.

STEP 9. Snug down the two clamp screws and re-check the two axis'.

STEP 10. Gently lift the torque handle.

STEP 11. Turn the z-axis screw counter-clockwise until the TD01 rests on the surface plate.

STEP 12. Secure it by pushing on the torque handle until it clicks.

STEP 13. Open the clamp area wide enough to fit the round work piece and the floating vee block.

STEP 14. If spacers need to be added or removed then remove the RC01/TD01 from the MCD01.

STEP 15. Loosen the two 8 mm bolts in the clamp bar and remove them. Add or remove spacers as required.

STEP 16. Place the RC01, spacer and clamp bar flat on the table.

STEP 17. Attach the 8 mm bolts and secure them with the hex key wrench.

STEP 18. Attach the RC01/TD01 to the MCD01 and secure it with the torque handle.

STEP 19. Insert the round work piece into the round clamp and allow it to bottom out on the surface plate.

NOTE: *Position the floating vee block against the round work piece and the set - screw is near the middle.*

STEP 20. Secure the round work piece by turning the setscrew clockwise until snug.

STEP 21. Check the flatness/trueness of the work piece by running the dial indicator across it.

STEP 22. If necessary, true the work piece by adjusting the two jackscrews.

STEP 23. Lift the torque handle.

STEP 24. Remove the RC01/TD01 with the round work piece.

The tooling is ready for machining as shown in Fig. 3.

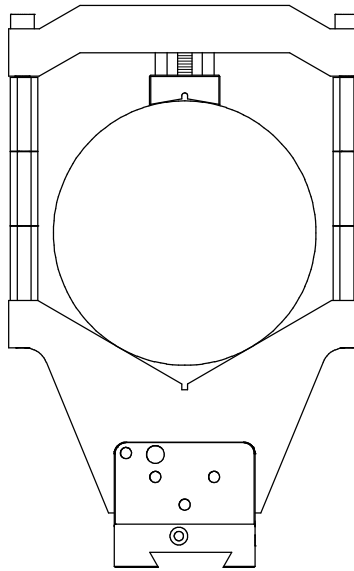


Figure 3

NOTE: When holding a smaller diameter work piece, remove the necessary spacers and attach the clamp bar in the correct position to fit the work piece as shown in Fig 4., steps 19-23.

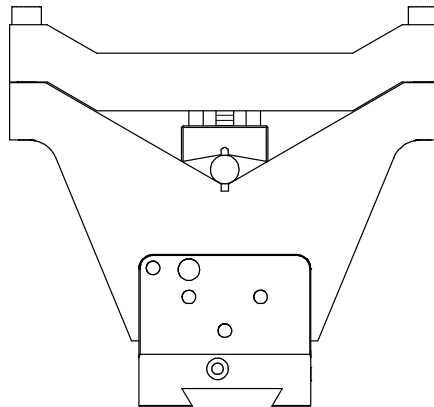


Figure 4

STEP 25. Insert the RC01/TD01 onto the presetting station.

STEP 26. Secure it by pushing on the torque handle until it clicks.

STEP 27. Follow steps 13 through 19 if the RC01 has already been properly trued.

RC01 Work Piece Truing Instructions and Chart

Round work pieces can be trued easily if the following procedure is followed. The dial indicator readings will be multiplied by a calculated ratio.

Step 28. Determine the diameter of the work piece being set up.

Step 29. (A). For truing the 1st or x-axis place the dial indicator ball at point A, the right centerline of the work piece as shown in Fig. 5. **(B).** Zero the indicator. **(C).** Move the indicator ball to point B, the left centerline. **(D).** Take the reading. **(E).** Multiply the reading by the number in the AB row of Table 1 corresponding to the work piece diameter in Table 1. **(F).** Turn the #1 screw to move the dial indicator back past zero for a total distance as calculated in Step 6. The first axis is trued.

Example: A 4.0 inch diameter work piece is clamped. The reading at point B is (-)0.0025 inch.

$$\begin{array}{r} \text{Multiply the B reading} \quad (-)0.0025 \\ \text{times(4.0 column, AB row)} \quad \underline{2.0000} \\ \hline (-)0.0050 \end{array}$$

Turn the #1 screw so the dial indicator moves back toward zero and past to (+)0.0025. Total distance is (-)0.0025 to (+)0.0025 equals 0.0050.

Example: A 2.0 inch diameter work piece is clamped. The reading at point B is (+)0.0015 inch.

$$\begin{array}{r} \text{Multiply the B reading} \quad (+)0.0015 \\ \text{times(2.0 column, AB row)} \quad \underline{3.0000} \end{array} \quad (+)0.0045$$

Turn the #1 screw so the dial indicator moves back toward zero and past to (-)0.0030. Total distance is (+)0.0015 to (-)0.0030 equals 0.0045.

DIA	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
AB	6.0	4.5	3.5	3.0	2.5	2.2	2.3	2.0	1.9	1.8	1.8	1.8
CD	3.0	2.6	2.3	2.0	1.8	1.6	1.6	1.5	1.5	1.5	1.4	1.4

Table 1

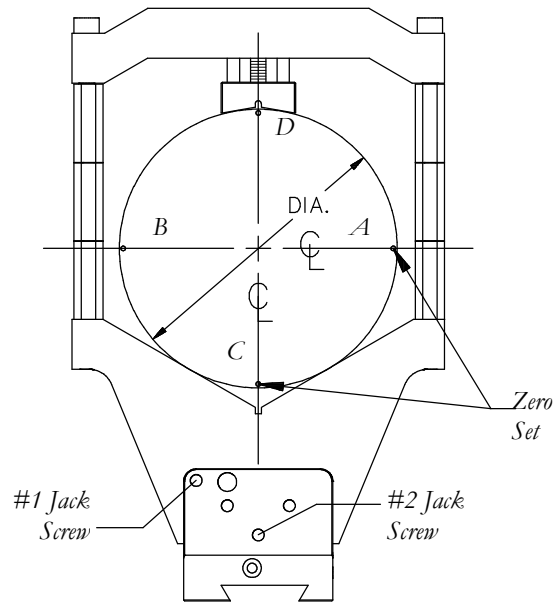


Figure 5

Step 30. (A). For truing the 2nd axis or y-axis, place the indicator ball at point C, the lower centerline of the round work piece as shown in Fig. 5. **(B).** Zero the indicator. **(C).** Move the indicator ball to point D, the upper centerline. **(D).** Take the reading. **(E).** Multiply the reading by the number in the CD row of Table 1. corresponding to the work piece diameter. Do the calculations similar to those shown above. **(F).** Turn the #2 screw to move the indicator back past the zero for a total distance calculated in Step 46. The second axis is trued.

Using the RH01 Replaceable Insert Holder

The main body of the RH01 attaches to the TD01 as explained in the “Instructions: Attaching a TD01 truing device to any work holder” as shown in Fig. 1.

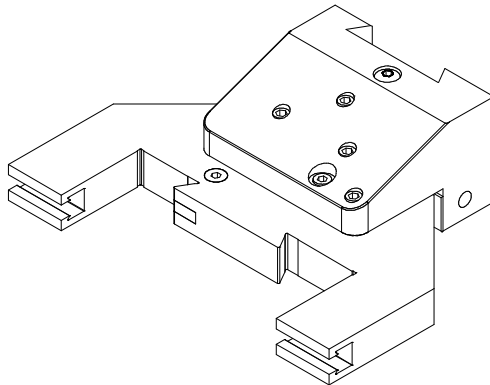


Figure 1

STEP 1. TRUING THE FIRST-AXIS ON THE TRUING STAGE

(A). Attach the RH01/TD01 to the MCD01 or PS01 on the truing stage as shown in Fig. 2. **(B).** Secure the work by pushing down on the torque handle until it clicks. DO NOT OVER TIGHTEN. **(C).** Loosen the two clamp screws 1/4 turn. **(D).** Position the indicator ball on the RH01 near the corner as shown in Fig. 2. This point is very close to the first-axis hinge line. **(E).** Zero the indicator. **(F).** Move the indicator ball to the other corner of the RH01. **(G).** Turn the #1 jackscrew until the indicator moves back to the zero set. The first-axis is now trued.

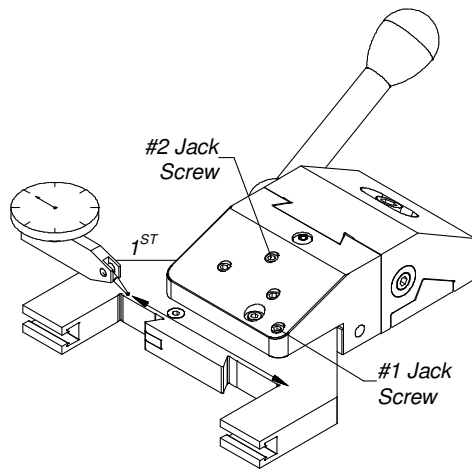


Figure 2

STEP 2. TRUING OF THE SECOND-AXIS (A). Place the indicator ball on the RH01 close to the TD01 pivot ball as shown in Fig. 3. This point is very close to the second-axis hinge line. **(B).** Zero the indicator. **(C).** Move the indicator out to the edge as shown in Fig. 3. **(D).** Turn the #2 jackscrew until the indicator moves back to it's zero set point. The second-axis is trued.

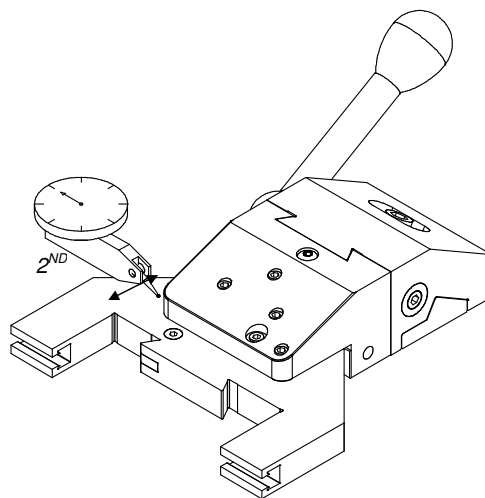


Figure 3

STEP 3. TRUING THE THIRD-AXIS

(A). Remove the RH01/TD01 from the truing station. **(B).** Place it upright, on the surface plate as shown in Fig. 4. **(C).** Position the indicator ball on RH01, down on the lower dovetail surface directly vertically in-line with the pivot ball in the TD01. **(D).** Zero the indicator. **(E).** Move the indicator ball over to the second position as shown in Fig. 4.

(F). Turn the cam as shown in Fig. 4 until the indicator returns to it's zero reading. The third-axis is trued.

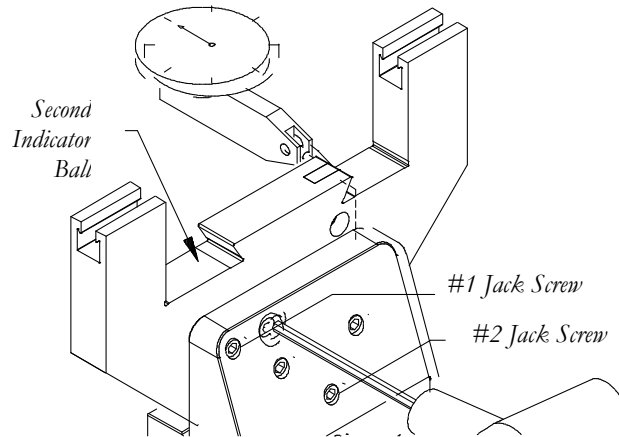


Figure 4

STEP 4. ATTACHING THE HORSESHOE CLAMP TO THE RH01 REPLACEABLE INSERT HOLDER

Place just the RH01 portion on the surface plate as shown in Fig 5.

NOTE: The RH01 is equipped with either a horseshoe style clamp or a multi-clamp. There are two types of inserts supplied with the RH01: a small and a large insert. The inserts are blank and are to be wire cut by the end user.

STEP 5. To connect the horseshoe style clamp to the RH01/TD01, slide the horseshoe clamp sideways into the RH01 body.

NOTE: The clamp will not be secure until an insert is attached.

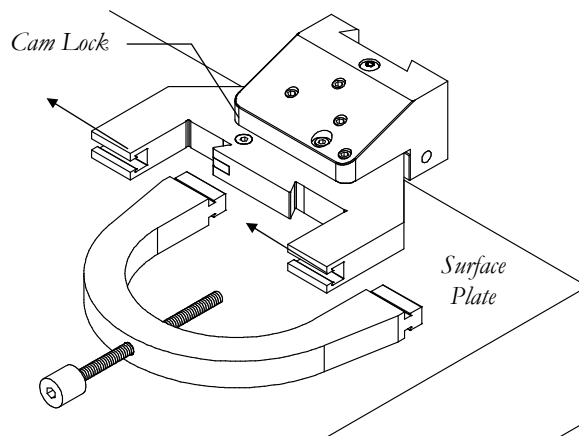


Figure 5

STEP 6. ATTACHING THE SMALL INSERT TO THE RH01 BODY

NOTE: Keep the RH01/TD01 with the attached clamp on the surface plate. Insert the small blank into the main body as shown in Fig. 6.

Secure the insert by turning the cam lock using the hex wrench. The insert will secure the clamp from detaching from the main body. **DO NOT OVER TIGHTEN CAM LOCK.**

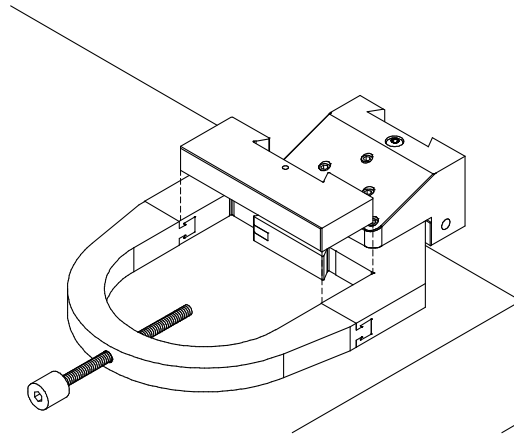


Figure 6

STEP 7. TRUING THE FIRST AND SECOND-AXIS OF THE INSERT ON THE TRUING STAGE

(A). Attach the RH01/TD01 to the MCD01 or PS01 on the truing stage. (B). Secure the TD01 by pushing down on the torque handle until it clicks. **DO NOT OVER TIGHTEN.** (C). Position the dial indicator on the insert at one side as shown in Fig 7. (D). Zero the indicator. (E). Move the indicator to the other corner of the insert. (F). Turn the #1 jackscrew until the indicator returns to zero. The first-axis is trued.

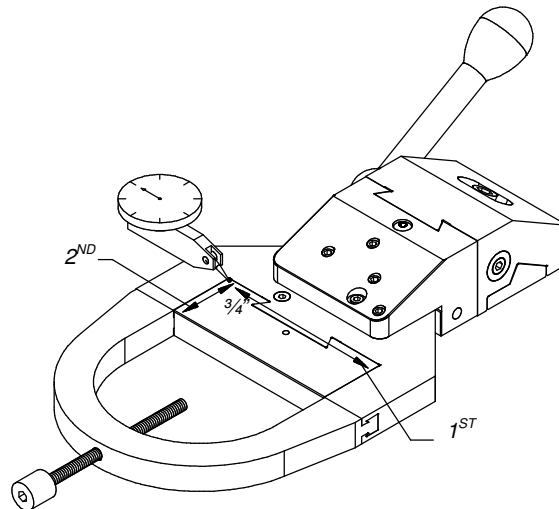


Figure 7

STEP 8. (A). For truing the second-axis place the indicator ball back at the starting corner. **(B).** Zero out the indicator. **(C).** Move the indicator ball out 3/4 inch in the second-axis direction. **(D).** Turn #2 jack screw until the indicator returns to zero and continue past in the negative direction the same amount as the reading was. The second-axis is trued.

STEP 9. Remove the RH01/TD01 from the truing station.

STEP 10. Place it upright on the surface plate as shown in Fig. 8.

STEP 11. TRUING THE INSERT THIRD-AXIS (A). Place the RH01/TD01 on the surface plate as shown in Fig. 8. **(B).** Place the indicator ball directly above the pivot ball of the TD01 on the insert as shown in Fig. 8. **(C).** Zero the indicator. **(D).** Move the indicator to the other end of the third-axis on the insert. **(E).** Turn the cam until the indicator returns to zero. The third-axis is trued.

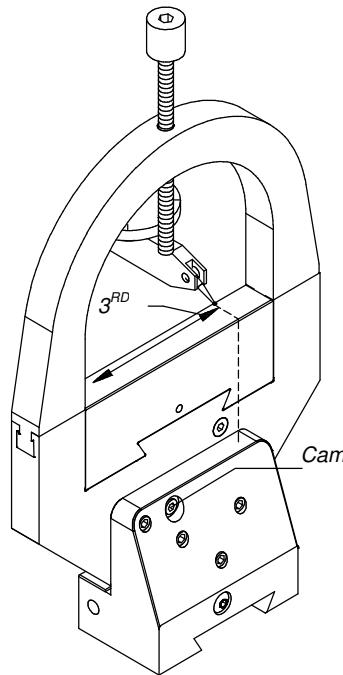


Figure 8

STEP 12. Secure the clamp screws and check all axis'.

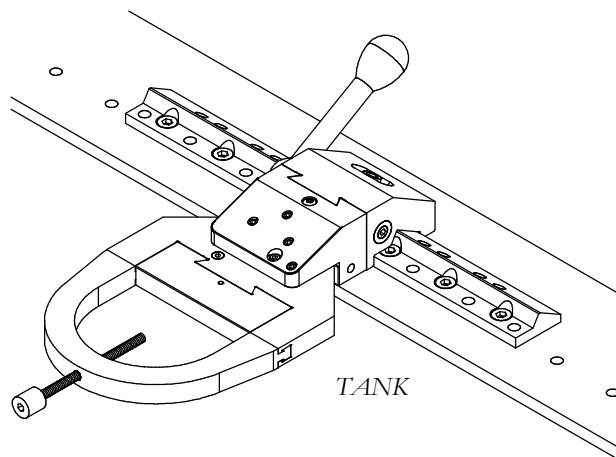


Figure 9

STEP 13. CUTTING A VEE SHAPE IN THE INSERT TO HOLD A 4 INCH DIAMETER ROUND

Attach the RH01/TD01 to the MCD01 in the machine as shown in Fig. 9.

STEP 14. Cut a truncated Vee shape wire cut into the insert to accept up to a 4 inch diameter round as shown in Fig. 10.

STEP 15. After the wire cut is made, skim-cut the location hole provided in the insert for reference location of the Vee.

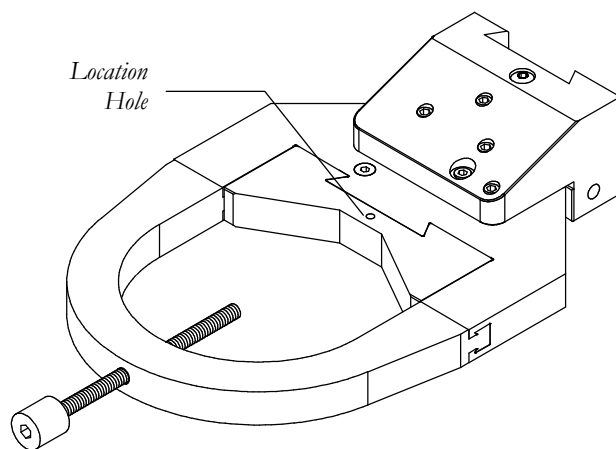


Figure 10

NOTE: A 4 inch diameter round may be held in the RH01 as shown in Fig. 11.

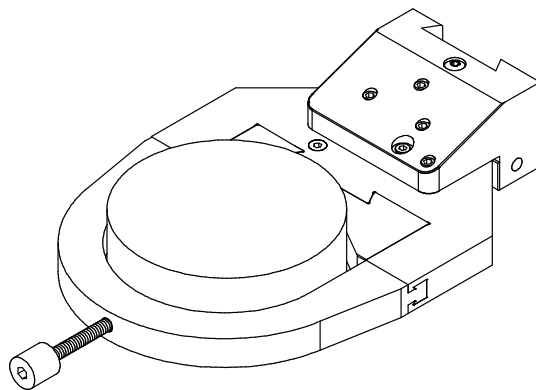


Figure 11

STEP 16. ATTACHING THE MULTI-CLAMP TO THE RH01 BODY

NOTE: If the RH01 has the horseshoe clamp and insert, then remove both pieces.

STEP 17. Attach the multi-clamp to the RH01/TD01 by placing just the RH01 portion on the surface plate, and slide the clamp sideways into the body the same way as the horseshoe clamp shown in Fig. 5.

STEP 18. Place a desired insert into the body the same as STEP 6 above and secure it with cam lock as shown in Fig. 12. **DO NOT OVERTIGHTEN.**

STEP 19. True the insert the same as described in STEP 7.

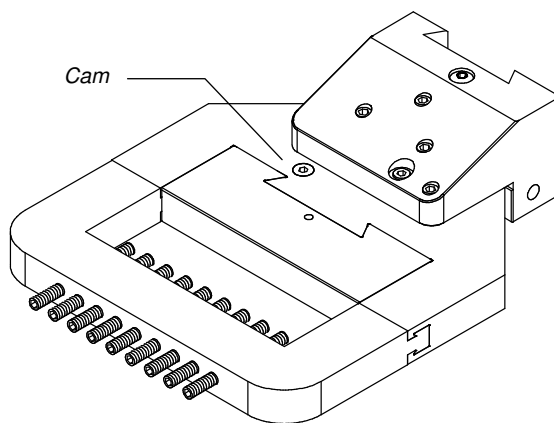


Figure 12

STEP 20. CUTTING THE INSERT FOR A MULTIPLE WORK PIECE APPLICATION

NOTE: There are up to nine clamp positions available with the multi-clamp on 10mm centers. Any combination of clamps may be used.

STEP 21. Wire cut nine Vee's into the example shown in Fig. 13.

STEP 22. After the Vee's have been cut then the reference location hole should be skim-cut.

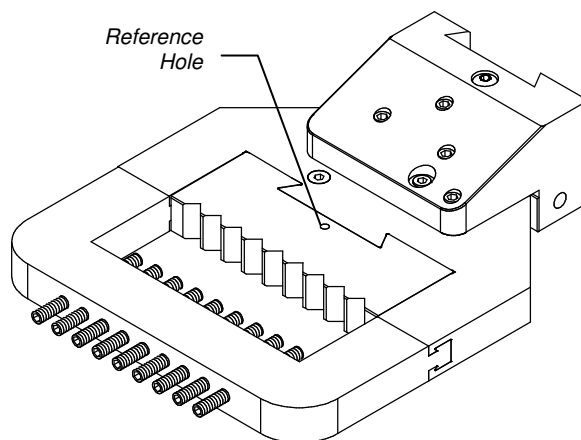


Figure 13

NOTE: In this case nine small rounds are clamped for wire machining as shown in Fig. 14

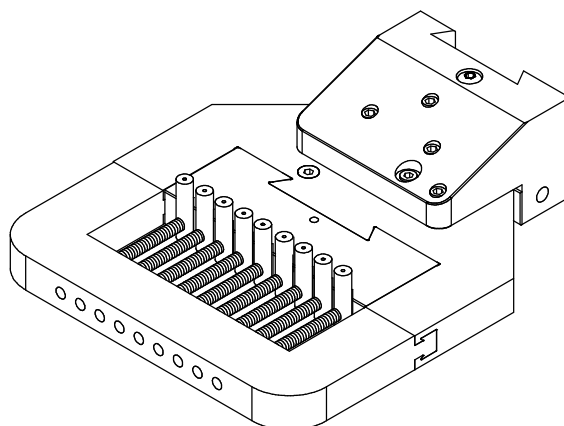


Figure 14

STEP 23. WIRE CUTTING THE SLIT INTO THE LARGE INSERT FOR HOLDING SPECIAL SHAPES

NOTE: The large insert is supplied with a location reference hole, a hinge hole and preset hole.

Place the large insert into the body of the RH01 and secure it with the cam lock as shown in Fig. 15. **DO NOT OVER TIGHTEN CAM LOCK.**

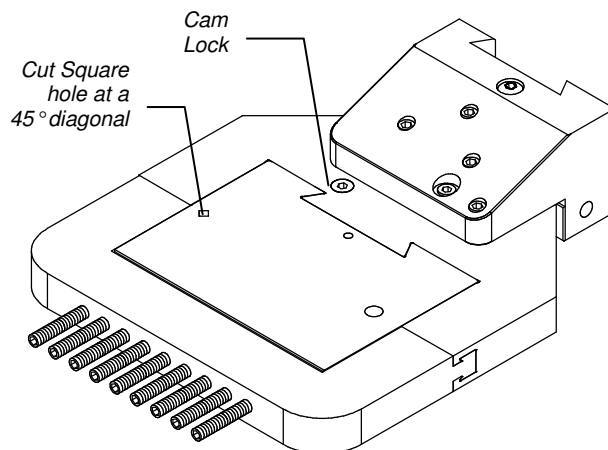


Figure 15

STEP 24. Perform a standard, hole pick-up on the preset hole.

STEP 25. Cut a square hole at a 45° diagonal to fit a .127 diameter pin as shown in Fig.15.

NOTE: *The walls of the square hole must be parallel for accuracy.*

STEP 26. Wire cut the slit from this hole straight through to the edge of the insert.

STEP 27. Cut back to the hinge hole as shown in Fig. 16. The slitted insert is ready for the compressing step.

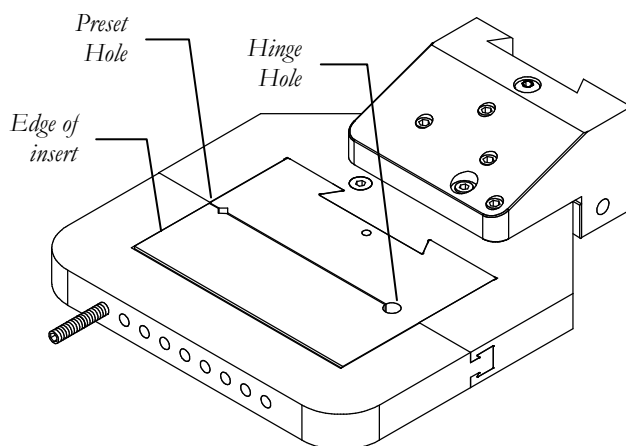


Figure 16

STEP 28. COMPRESSING THE SLITTED INSERT

Remove all the clamp screws in the multi- clamp, except one at the same side as the preset hole, as shown in Fig 16.

STEP 29. Place the 3/16 inch diameter ball bearing between the clamp screw and the insert as shown is Fig. 17.

NOTE: The ball bearing eliminates any lateral motion when the clamp screw turns.

STEP 30. Insert a 0.125 inch diameter dowel pin into the preset hole.

STEP 31. Tighten the clamp screw so that the dowel pin is secured in the preset hole.

NOTE: This step compresses the insert so that after the custom shape is cut, the insert will open slightly, facilitating work piece insertion.

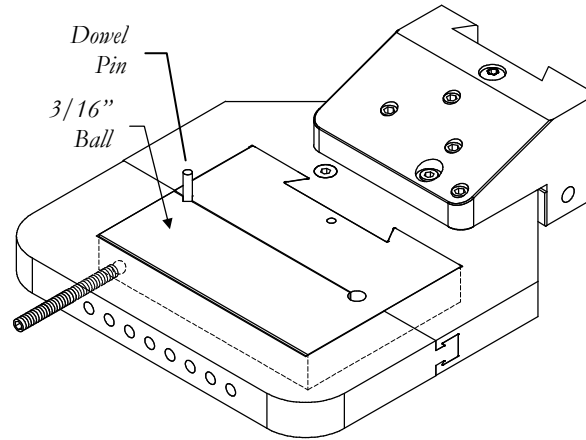


Figure 17

STEP 32. WIRE CUTTING THE CUSTOM SHAPE IN THE COMPRESSED, SLOTTED INSERT

Wire cut the custom shape into the slotted insert as done in normal machining practice.

STEP 33. After completing the first half of the custom shape, remove the slug.

STEP 34. After the second cut remove the second slug.

STEP 35. Move the machine upper head away from the RH01.

STEP 36. Hold on to the .125 inch diameter dowel pin with one hand and loosen the clamp screw slightly with the other hand.

STEP 37. Remove the dowel pin. The insert is ready to hold the custom work piece.

Using the DDV01 Dual Dovetail Vise

The DDV01 attaches to the TD01 as described in the Instructions for attaching a work piece holder to a TD01 section.

NOTE: *The vise is equipped with two removable inserts. When clamping dovetail form tools that are 1.5 inches to 3.0 inches wide then remove both inserts.*

STEP 1. Insert the DDV01 onto the presetting truing station.

STEP 2. Turn the z-axis screw clockwise until the TD01 is slightly off the surface plate.

STEP 3. Secure it by pushing the torque handle until it clicks.

STEP 4. (A). True the first axis (x-axis) by placing the indicator ball 1 1/4 inches from the right end of the vise as shown in Fig. 1, point A. **(B).** Back off the two clamp screws about 1/4 turn. **(C).** Zero the indicator. **(D).** Move the indicator to the other vise bed as shown in Fig. 1, point B. **(E).** Turn the #1 jackscrew until the indicator returns back to zero. (The first axis is now true).

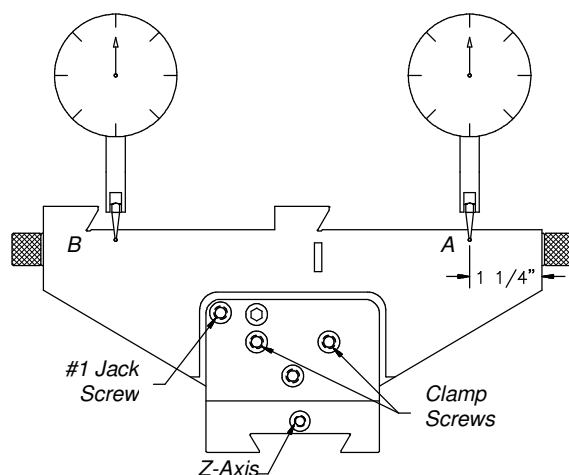


Figure 1

STEP 5. (A). Place the indicator ball next to the pivot ball as shown in Fig. 2, point A. **(B).** Zero the indicator. **(C).** Move the indicator out to 1/4 inch from the vise bed as shown in Fig 2, point B. **(D).** Turn the #2 jackscrew until the indicator moves back to the zero reading. (the second axis is now true)

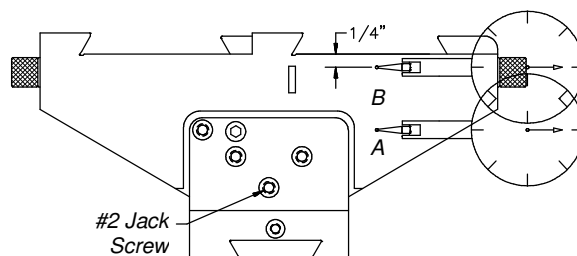


Figure 2

STEP 6. Snug down the two clamp screws and re-check the two axis'.

STEP 7. Lift the torque handle.

STEP 8. Remove the DDV01/TD01 and place it on the surface plate.

STEP 9. (A). Place the indicator ball on the vise bed directly above the pivot ball as shown in Fig. 3, point A. **(B).** Zero the indicator. **(C).** Move the indicator to the right end as shown in Fig. 3, point B. **(D).** Turn the cam until the indicator returns to zero. The third axis is trued in.

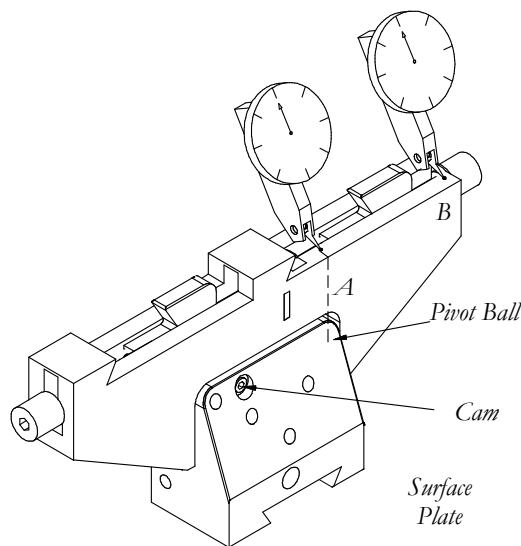


Figure 3

STEP 10. Move the indicator to the left end of the left vise bed to double check.

NOTE: *If there is a difference in reading from one end to the other then turn the cam for final adjustment. (the third axis is now true)*

STEP 11. Insert the DDV01/TD01 back on the presetting truing station.

STEP 12. Turn the z-axis screw counterclockwise until the TD01 rests on the surface plate and secure it by pushing on the torque handle until it clicks.

STEP 13. Open the left side vise wide enough to fit the dovetail by turning the lead screw counterclockwise then insert the dovetail form tool and allow it to bottom out on the surface plate.

STEP 14. Secure the form tool by turning the lead screw clockwise until snug.

STEP 15. Insert the THW07 torque wrench and torque the lead screw.

STEP 16. Open the right side vise enough to fit the dovetail form tool by turning the lead screw counterclockwise then insert the dovetail form tool and allow it to bottom out on the surface plate.

STEP 17. Secure the form tool by turning the lead screw clockwise until snug.

STEP 18. Insert the THW07 torque wrench and torque the lead screw.

STEP 19. Lift the torque handle and remove the DDV01/TD01 with tools.

The two dovetail form tools are ready for machining as shown in Fig 4.

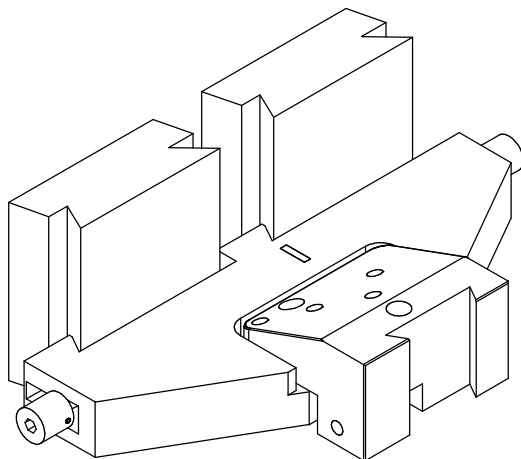


Figure 4

NOTE: When holding smaller dovetail form tools, insert the two vise bed inserts into each jaw as shown in Fig. 5.

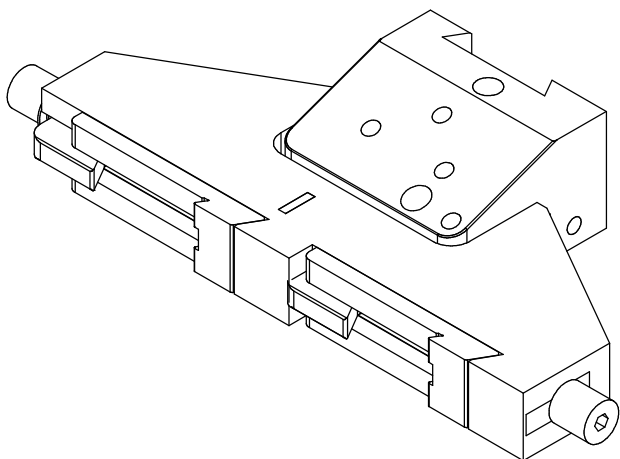


Figure 5

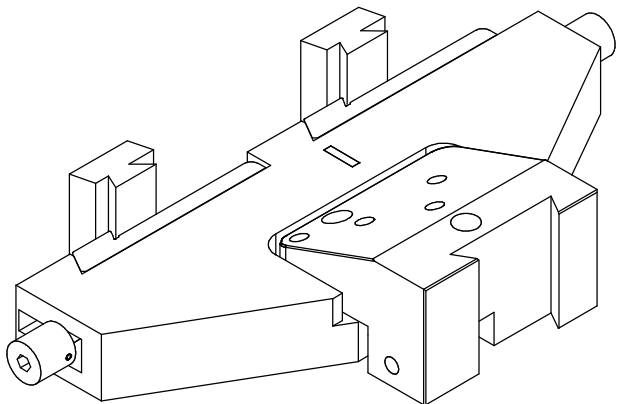


Figure 6

Using the VE01 Vertical Extender & TD04 Truing Device

STEP 1. The VE01 vertical extender is a base component that attaches to the MCD01 main clamping device and allows the work holder to be held at a higher (or lower) vertical height as shown in Fig. 1. The VE01 Vertical Extender, is designed to be used with a self-clamping truing device or self-clamping work holder.

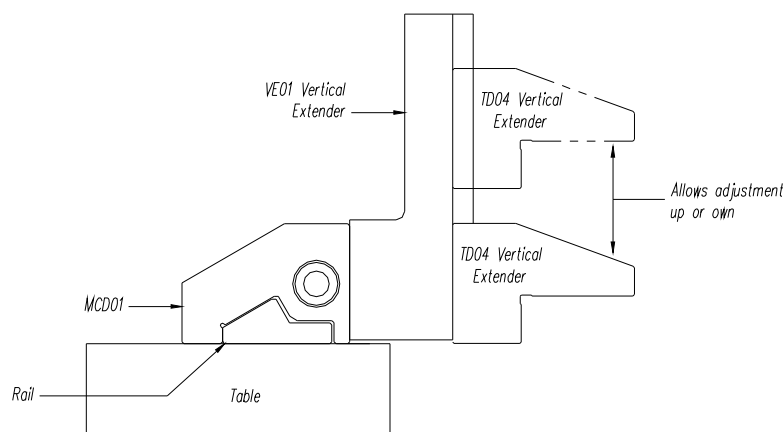


Figure 1

STEP 2. Attach the TD04 self-clamping truing device to any work holder. The TD04 is attached to a work holder the same as a TD01 described in Section 6, “Instructions: Attaching the TD01 truing device to any work holder.”

STEP 3. Clamp the VE01, Vertical Extender, onto the TS-MCD01 truing station as shown in Fig. 2.

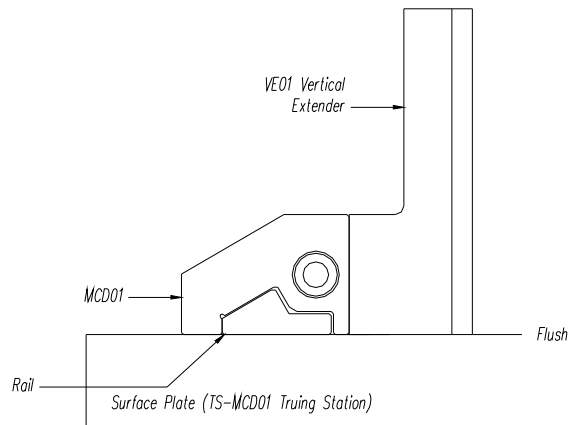


Figure 2

Note: Make sure the z-axis height adjustment screw is turned counterclockwise until the VE01 sits flush on the Surface plate.

STEP 4. Attach the work holder/TD04 to the VE01 vertical extender at the desired height as shown in Fig. 3.

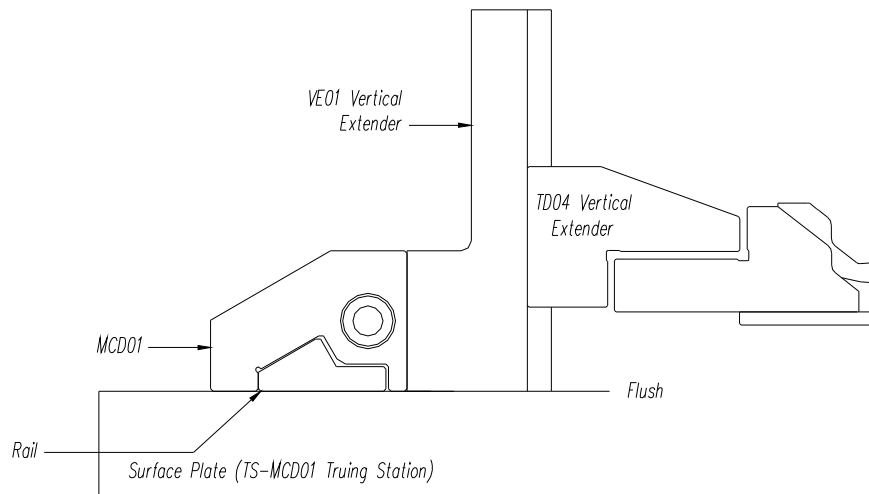


Figure 3

STEP 5. Load the work piece in the work holder as described in the Sections on how to use each holder.

STEP 6. Once the work piece is loaded into the work holder, turn the z-axis height adjustment clockwise until it stops as shown in Fig. 4. ***DO NOT FORCE THE SCREW BEYOND THIS STOP.***

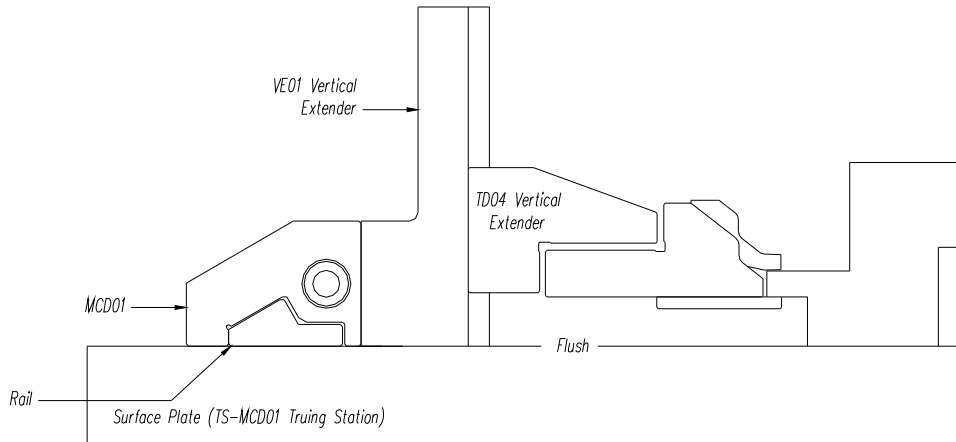


Figure 4

STEP 7. Release the handle on the MCD01 main clamping device and turn the z-axis height adjustment screw an additional $\frac{1}{4}$ turn.

STEP 8. Retighten the MCD01 torque handle until it “clicks.”

STEP 9. True the work piece in the work holder as described in the Sections on how to use each holder.

STEP 10. Turn the z-axis height adjustment screw counter clockwise one turn and load the VE01/TD04/work holder into the machine.

Using the HA01 Horizontal Adapter

STEP 1. The HA01 is designed to provide a horizontal dovetail reference. Most all work holders can be rotated 90 degrees in the x-axis with the HA01. The HA01 is used with the VE01 vertical extender as shown in Fig. 1.

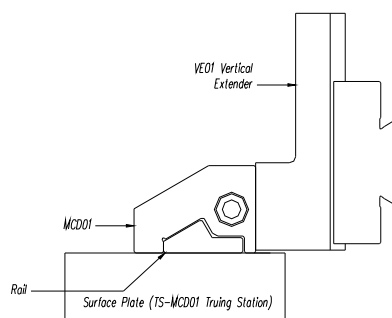


Figure 1

STEP 2. The HA01 can be set up off line on a surface plate between the VE01 vertical extender and a work holder/TD04. The height of the work holder/TD04/HA01 can be adjusted up or down on the VE01.

Note: Make sure when adjusting the HA01 up or down on the VE01, that at least some of the contact pad on the HA01 is making contact with the VE01 as shown in Fig. 2.

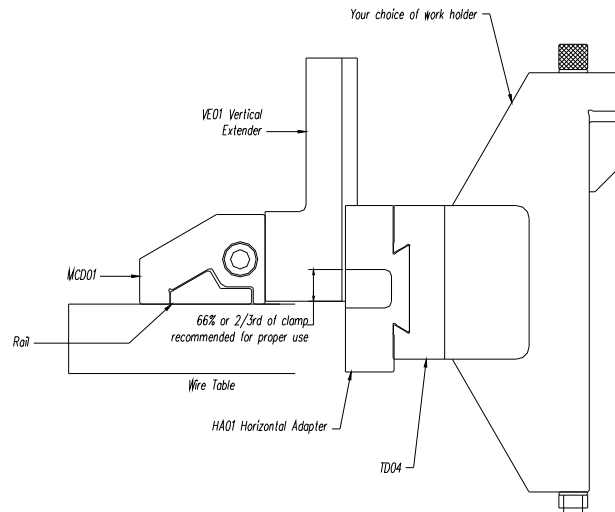


Figure 2

Using the MB01 Multi Block

STEP 1. The MB01 multi block is designed as a multi axis base for the MRC01 multi round clamp. The MB01 is self-locking and can be attached to a VE01 vertical extender as shown in Fig. 1.

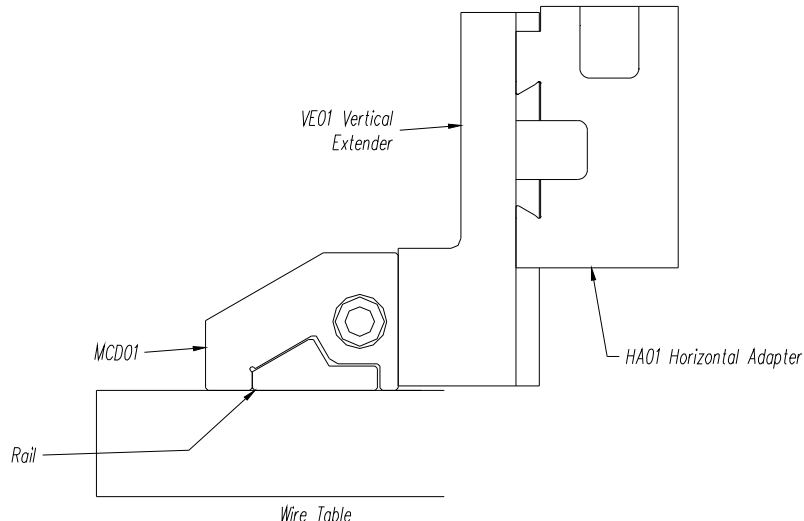


Figure 1

STEP 2. Bolt the MRC01 multi round clamp onto the MB01 multi block using the 4 ea. 6mm low head bolts.

Note: Make sure the z-axis height adjustment screw is turned counterclockwise until the fixture sits flush with the VE01 on the surface plate. AFTER THE MBO1

IS LOCKED IN PLACE, TURN THE Z-AXIS HEIGHT ADJUSTMENT SCREW UNTIL IT BOTTOMS OUT. Do this same procedure for each axis to be used in the cutting of the work pieces.

STEP 3. Determine the first cut orientation of the work pieces and attach the MB01 multi block to the VE01 vertical extender so as to hold the work pieces in that orientation.

STEP 4. Attach the M5 x 10mm screws in both the upper and lower portions of the MRC01 multi round clamp for every v-notch that is to hold a work piece (up to 10 work pieces.)

STEP 5. Load the work pieces into the MRC01 multi round clamp and secure by tightening the M5 screws with a 3mm hex wrench as shown in Fig. 2.

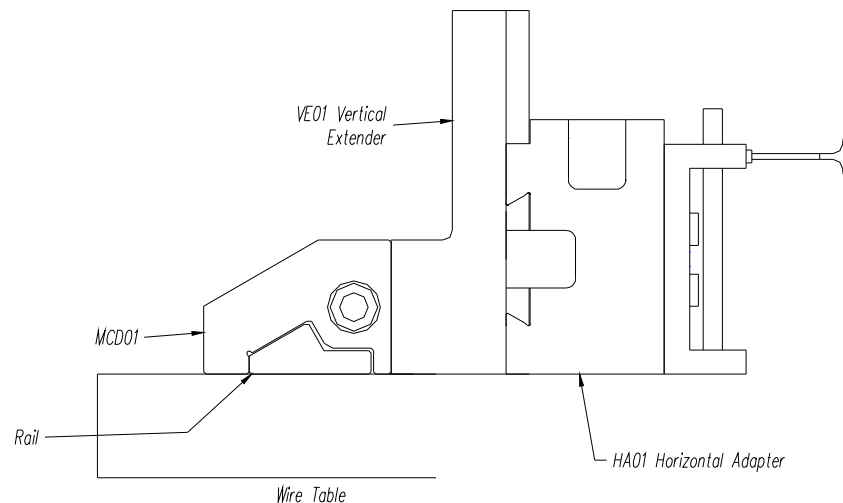


Figure 2

STEP 6. Move the VE01/MB01/MRC01 and work pieces over to the machine.

STEP 7. Lock onto the MCD01 main clamping device by lowering the torque handle until it “clicks.”

STEP 8. Adjust the z-axis height of the work pieces with the z-axis height adjustment screw on the MB01 or VE01 as necessary.

STEP 9. For cutting the parts in a different orientation, remove MB01/MRC01 and work pieces from the VE01 vertical extender and reattach the MB01 with the parts in the new correct orientation.

STEP10. Repeat step 8.

Attaching the TD03 Direct Rail Mount Truing Device To Any Work Holder

STEP 1. EXAMINING THE TD03 ADJUSTMENT SCREWS The TD03 is shipped with the two adjustment screws assembled as shown in Fig. 1. The screw pads should extend 1/16 inch out from the surface of the TD03.

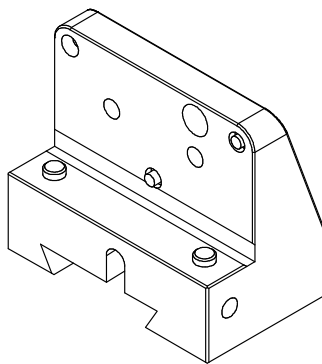


Figure 1

STEP 2. ASSEMBLING THE TD03 AND WORK PIECE HOLDER Hold the TD03 upside down in the palm of your hand. Have the clamp screw hole toward you as shown in Fig. 2.

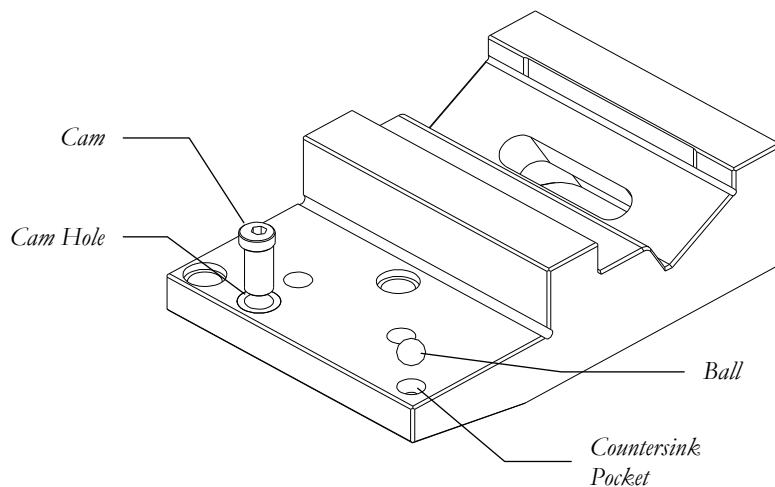


Figure 2

STEP 3. Apply ample silicone grease on the cam and insert it into the cam hole in the TD03. Apply silicone grease on the stainless steel ball bearing and place it in the countersunk pocket and apply it also to the ceramic pads on the work piece holder.

STEP 4. PREPARING THE CLAMP SCREWS Insert each clamp screw into three Belleville springs back-to-back, front-to-front, properly as shown as shown in Fig 3.

STEP 5. Place the work holder, in this case a V06 six inch vise, over the matching holes of the TD03 and allow the cam and ball bearing to seat into place as shown in Fig. 3.

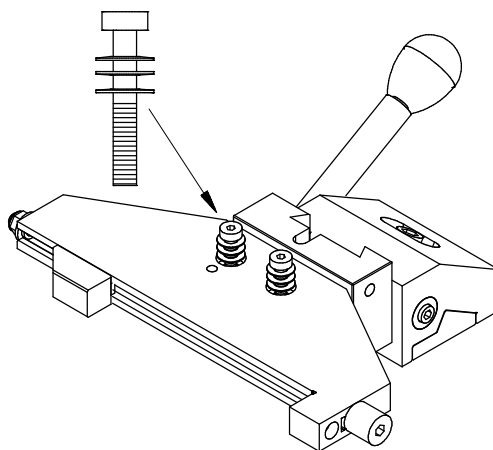


Figure 3

STEP 7. Insert the clamp screws into their respective holes in the work holder. And turn the screws in with the hex driver until they bottom out then reverse each screw 1/4 turn. The proper spring pressure for truing is now achieved. It's now ready for the truing station.

Clamping and Truing a Work Piece with the TD03 and SB01/SB02

STEP 1. The SB01 and SB02 spacer blocks are designed to aide in off-line presetting of a work piece held in a work holder with a TD03 direct-mount truing device. The SB01 spacer block is to be located between the surface plate and R75-50-8M rail on the truing station as shown in Fig. 1.

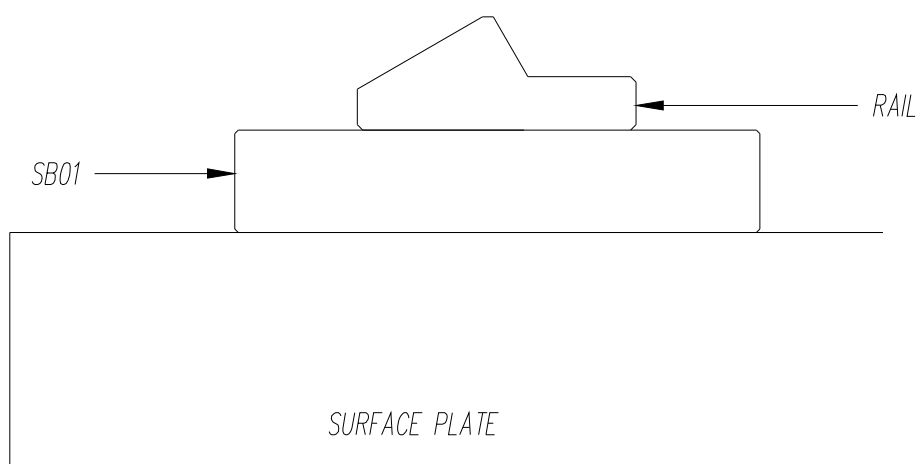


Figure 1

STEP 2. Secure the SB01 spacer plate to the SP1824 surface plate with M8 x 16mm cap screws.

Note: The holes for the rail should be placed toward the inside of the surface plate as shown in Fig. 2.

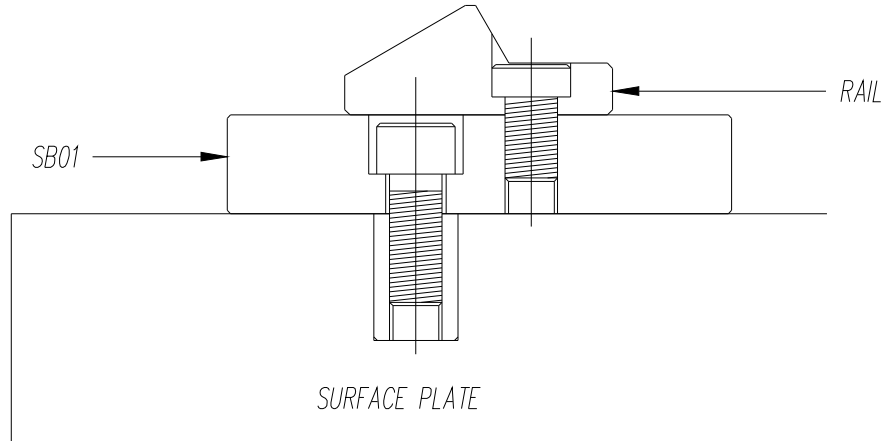


Figure 2

STEP 3. Secure the R75-50-8M rail to the SB01 spacer block with M8 x 16mm cap screws.

STEP 4. Secure the TD03 truing device and work holder to the R75 rail with the M8 x 25mm cap screw as shown in Fig. 3.

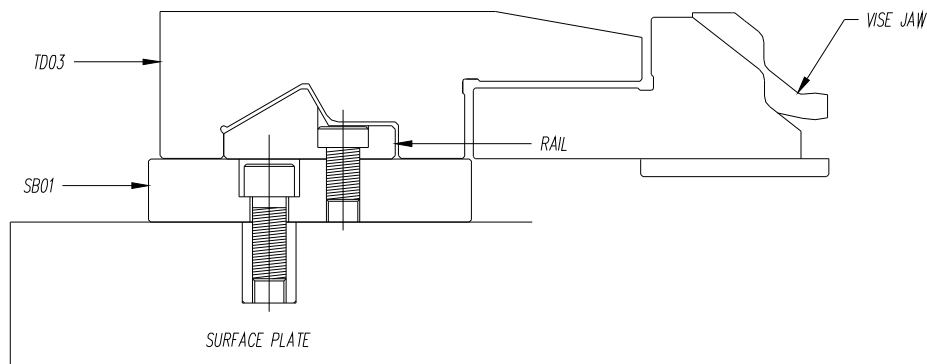


Figure 3

STEP 5. Place the work piece on the SB02 and carefully slide them up to the bed of the work holder as shown in Fig. 4.

Note: If the work holder is a vertical vise, the z-axis may require adjustment prior to loading of the work piece. See Section 13, "Instructions: Using the VV01/VV03 vertical vise" for more information.

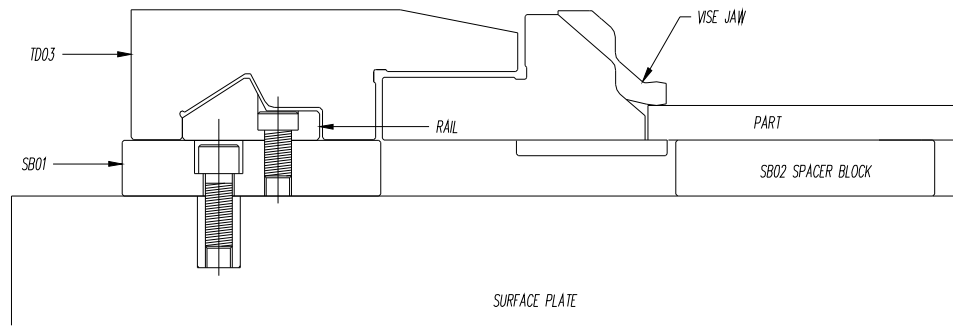


Figure 4

STEP 6. Secure the work piece by using the torque wrench or 3mm hex wrench.

STEP 7. Loosen the M8 x 25mm clamp down bolt and carefully remove the SB02 presetting plate from under the work piece then re-tighten the M8 x 25mm clamp down bolt.

STEP 8. True the work holder.

STEP 9. Loosen M8 x 25mm clamp down bolt from the TD03. With one hand supporting the TD03/work holder with work piece, remove the M8 x 25mm clamp down bolt.

Note: Special care should be given to not bump the work piece when removing it from the presetting station.

STEP 10. Secure the TD03/ work holder and work piece into the machine on a Gaiser rail with the M8 x 25mm clamp down bolt.

Attaching the TD05 Direct Mount Truing Device to the V08 Vise

STEP 1. EXAMINING THE TD05 ADJUSTMENT SCREWS

The TD05 is shipped with the two adjustment screws assembled as shown in Fig. 1. The screw pads should extend 1/16 inch out from the surface of the TD05.

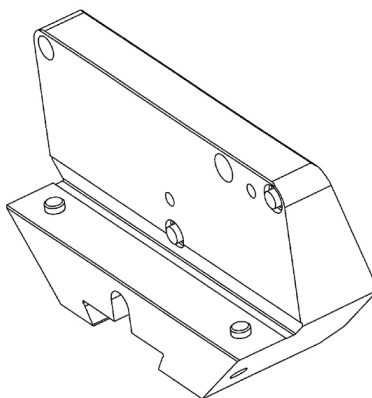


Figure 1

STEP 2. ASSEMBLING THE TD05 AND V08

Place the TD05 truing device upside down onto the surface plate as shown in Fig. 2.

Note: The TD05 could alternatively be held in the palm of the hand.

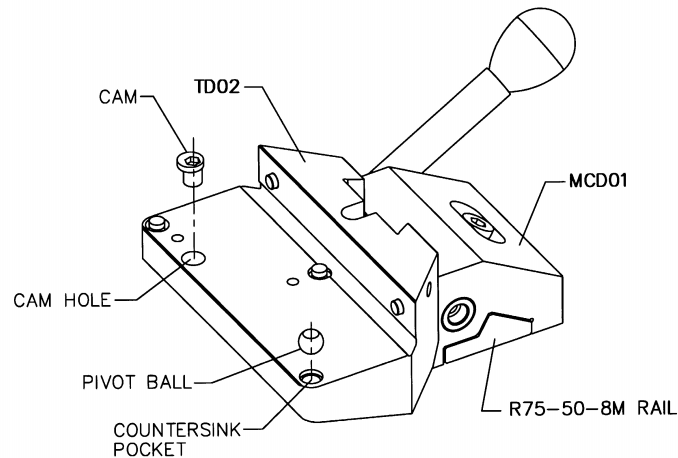


Figure 2

STEP 3. Apply ample silicone grease on the cam and insert it into the cam hole in the TD05 as well as applying silicone grease on the stainless steel pivot ball and placing it in the countersink pocket with the hole facing up.

STEP 4. Apply silicone grease to the ceramic pads on the work piece holder.

STEP 5. PREPARING THE CLAMP SCREWS

Insert each clamp screw into three back-to-back, front-to-front Belleville washers as shown as shown in Fig 3.

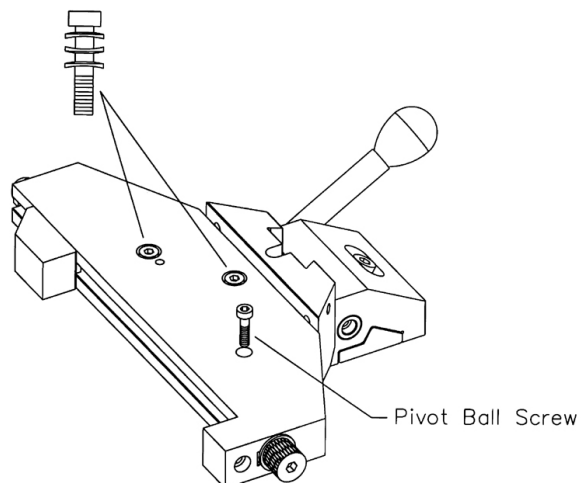


Figure 3

STEP 6. Place the V08 vise over the matching holes of the TD05 and allow the cam and pivot ball to seat into place as shown in Fig. 3.

STEP 7. Steady the work holder with a free hand.

STEP 8. Insert the pivot ball screw into the vise, through the pivot ball into the TD05.

STEP 9. Insert the clamp screws into their respective holes in the work holder.

Clamping and Truing a Work Piece with the TD05 and SB03/SB04

STEP 1. The SB03 and SB04 spacer blocks are designed to aide in off-line presetting of a work piece held in a V08 vise with a TD05 direct-mount truing device. The SB03 spacer block is to be located between the surface plate and R200-50-8M rail on the truing station as shown in Fig. 1.

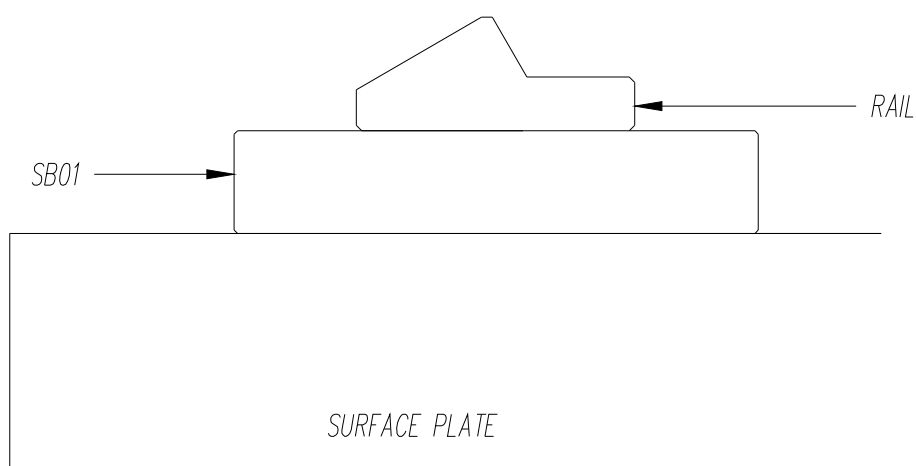


Figure 1

Note: In order to secure the SB03 to a surface plate, two additional hold-down inserts should be installed into the surface plate. This is done with the aide of the S5068 Insert Installation Kit.

STEP 2. Secure the SB03 spacer plate to the SP1824 surface plate with M8 x 16mm cap screws.

Note: The holes for the rail should be placed toward the inside of the surface plate as shown in Fig. 2.

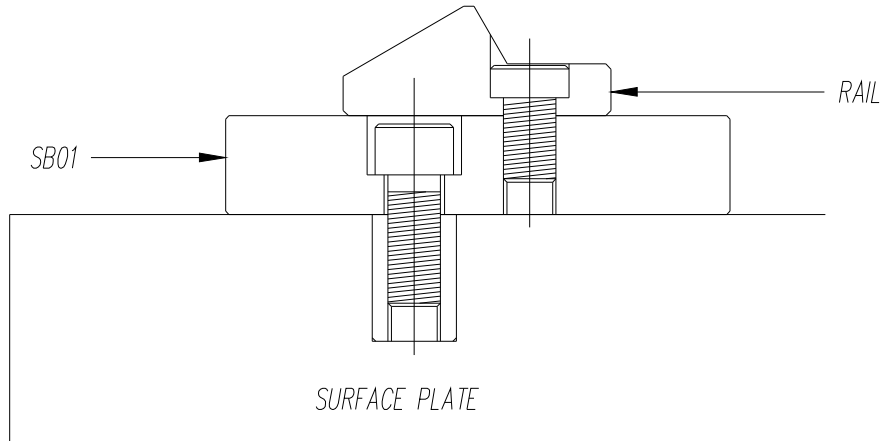


Figure 2

STEP 3. Secure the R200-50-8M rail to the SB03 spacer block with M8 x 16mm cap screws.

STEP 4. Secure the V08/TD05 truing device to the R200 rail with the M8 x 40mm cap screw as shown in Fig. 3.

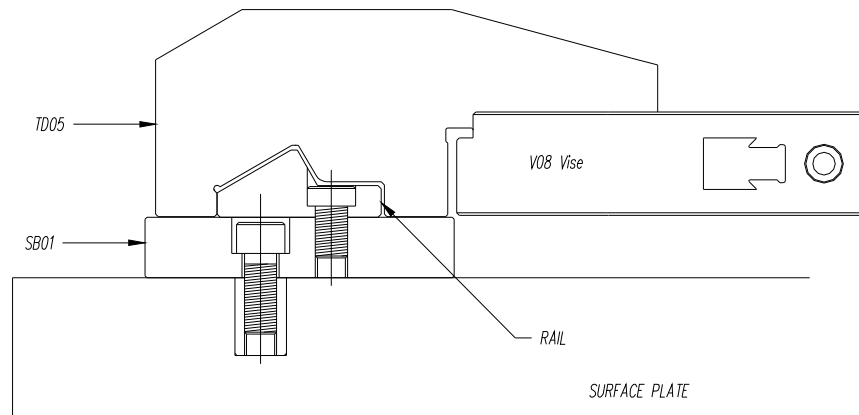


Figure 3

STEP 5. Place the work piece on the SB04 and carefully slide them up to the bed of the V08 as shown in Fig. 4.

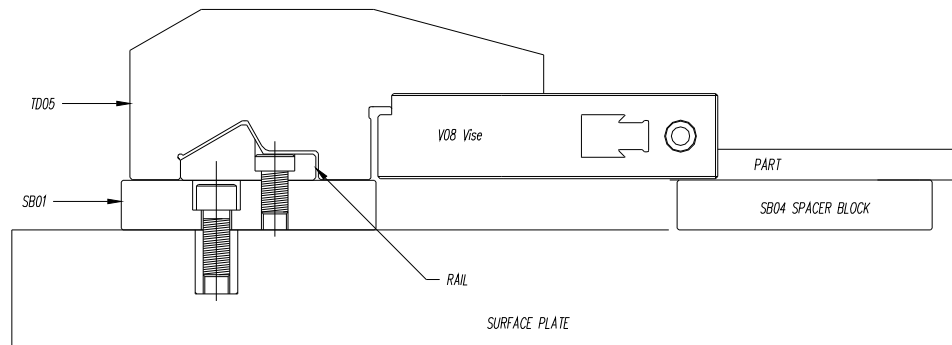


Figure 4

STEP 6. Secure the work piece by using the THW15 torque wrench.

STEP 7. Loosen the M8 x 40mm clamp down bolt and carefully remove the SB04 presetting plate from under the work piece.

STEP 8. Retighten the M8 x 40mm clamp down bolt.

STEP 9. True the V08. For more information, see Section 12, “Clamping and truing a work piece with the V08 vise.”

STEP 10. Loosen the M8 x 40mm clamp down bolt from the TD05. With one hand supporting the TD03/work holder with work piece, remove the M8 x 40mm clamp down bolt.

Note: Special care should be given to not bump the work piece when removing it from the presetting station.

Option: Because the TD05 has an easy on/off hole, two M8 x 40mm cap screws allow for one to be left on the truing station while a second is left in the machine. This aids in the speed of loading and unloading of the vise.

STEP 11. Secure the V08/TD05 and work piece into the machine on a Gaiser rail with the M8 x 40mm clamp down bolt.



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