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Field Technical Procedure

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Printers Affected	**T1000**

INTERNAL USE ONLY

Print Head Alignment

This procedure describes the proper way to align the print heads. Accurate print head alignment is critical to ensure high quality image output on the T1000.

Before Starting

Follow the instructions in this section prior to starting the procedure.

- For safety concerns, please read and understand the EFI Ink Jet Printer Safety Guide located at http://www.vuteksupport.com/doc.php?doc=683 prior to attempting any service work on your printer.
- Verify you have all the parts and software to complete this procedure.

Required Materials

This procedure requires the following materials.

Tools		
Item	Description	Qty
45094198	Gauge Height Print Gap T1000	1

Print Head Alignment Overview

This section outlines the general installation steps.

Print Head Adjustment

This section contains information about what each adjustment screw does.

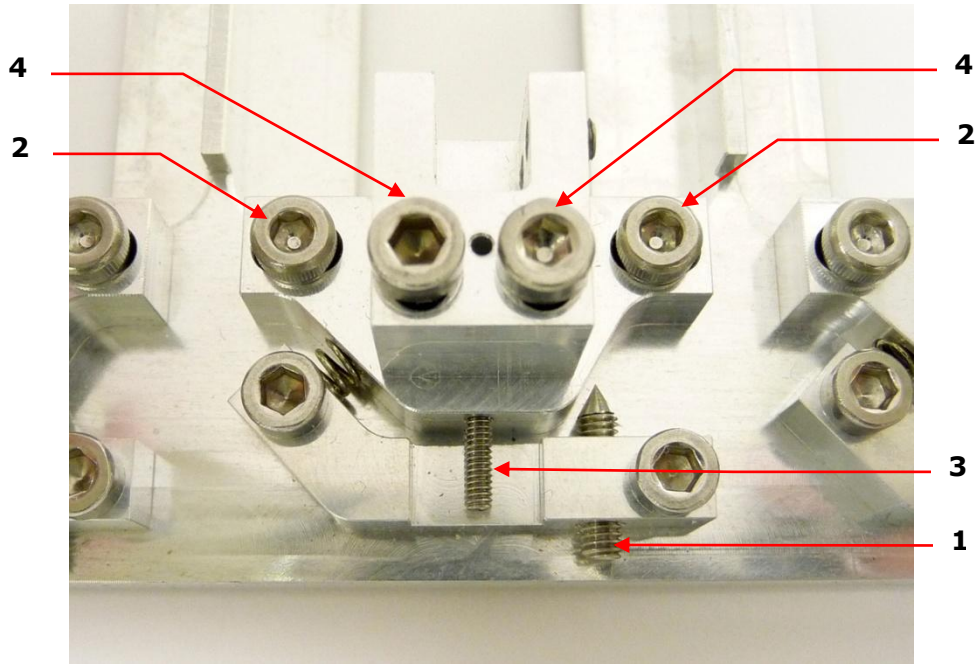


Figure 1: Adjustment Screws

1 Head rotation adjustment screw (1.5mm hex)

2 Head rotation lock screws

3 Head "Y" placement adjustment screws

4 Head "Y" placement lock screws

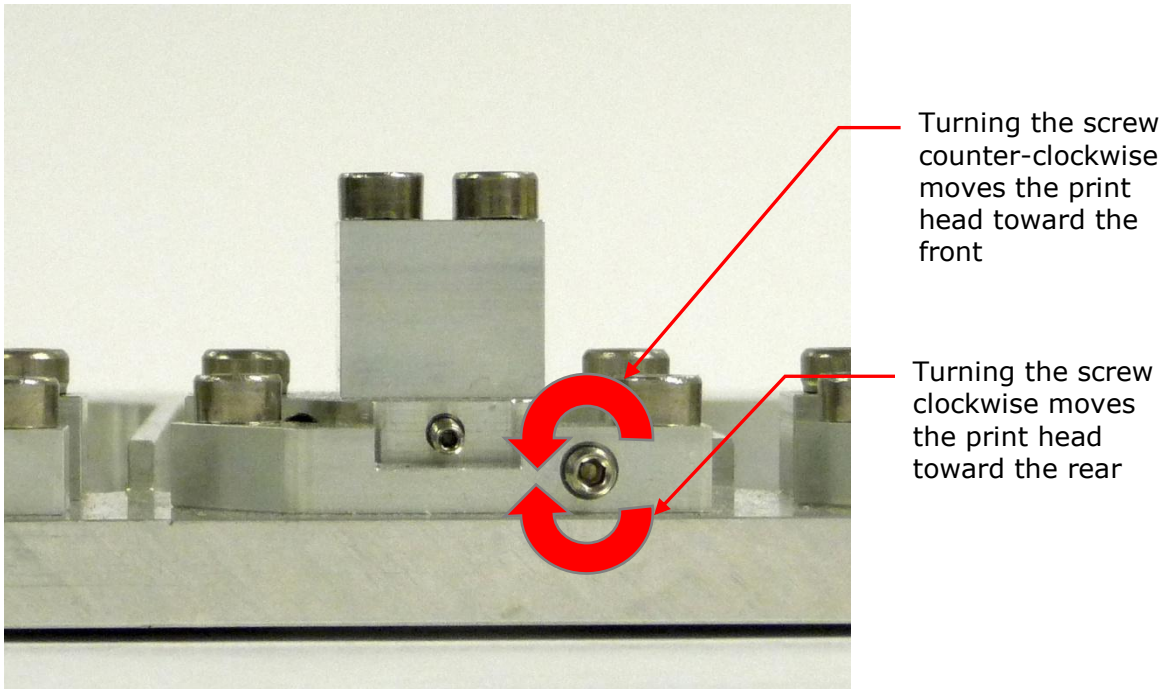


Figure 2: Screw movements

When fine adjustment is required, use small increments when turning the front screw. Many tests may require 1/16th of a turn or less for final alignments.

Preparation

The following conditions must be met before aligning the print heads.

Important: Proper print head alignment can only be achieved when the T1000 printer is fully functional and at operating temperature.

1. Power the printer **ON** and allow the heads to reach operating temperature.
2. Use the 45094198 Gap Tool to set the carriage height at 1mm.

Important: Use only high quality media such as glossy photo stock or equivalent. EFI does not recommend rough, porous or matte-finished media for use during head alignment. These media types will result in image distortions and false alignment readings.

3. Print media must be at least 48 inches wide.
4. To align the white ink print head, a section of dark brown vinyl or similar shade material is required to provide contrast.
5. Ensure that the print head voltages have been set properly.

Alignment Procedures

Table 1 provides an overview of the ten sequential procedures required to perform T1000 head alignments. These alignments must also be repeated for white ink.

Table 1: Overview of Print Head Alignment Procedures

Step	Test Description	Comments
1	Nozzle check	Visual
2	Head rotation alignment	Mechanically adjusted head alignments
3	Orthogonality	Software adjustment
4	Head Y placement	Mechanically adjusted head alignments
5	6x3 Forward/reverse	Software adjustment
6	6x3 Color to Color	Software adjustment
7	Bidirectional Alignment 6x3	Software adjustment
8	12x3 Head Forward/reverse	Software adjustment
9	12x3 Color to Color	Software adjustment
10	Bidirectional Alignment 12x3	Software adjustment

Run a print sample before performing the nozzle test to ensure that the heads are at operating temperature. **Alignments must be run in both color and white for proper alignment to be achieved**.

Important: Performing the alignment procedures out of sequence will result in misaligned heads and poor print quality.

Important: Precision alignment of the KL (black- left) print head ensures the base reference for all other print head alignments to follow. Improper alignment of KL print head will result in poor alignment across all of the print heads.

Nozzle Check

Each of the five dual row print heads has a total of 636 nozzles per color (2 x 318 per dual head) The Nozzle Check test print is used to verify that all of the nozzles are firing.

1. Ensure that all printer functions are stable.
2. Run a small print sample to ensure that the printer is functioning properly.
3. Click the **Print Nozzle Check** button in the T1000 Control Panel. Adjust the position and click **Start Print**. This will start printing the nozzle checks for all colors. See Figure 3.

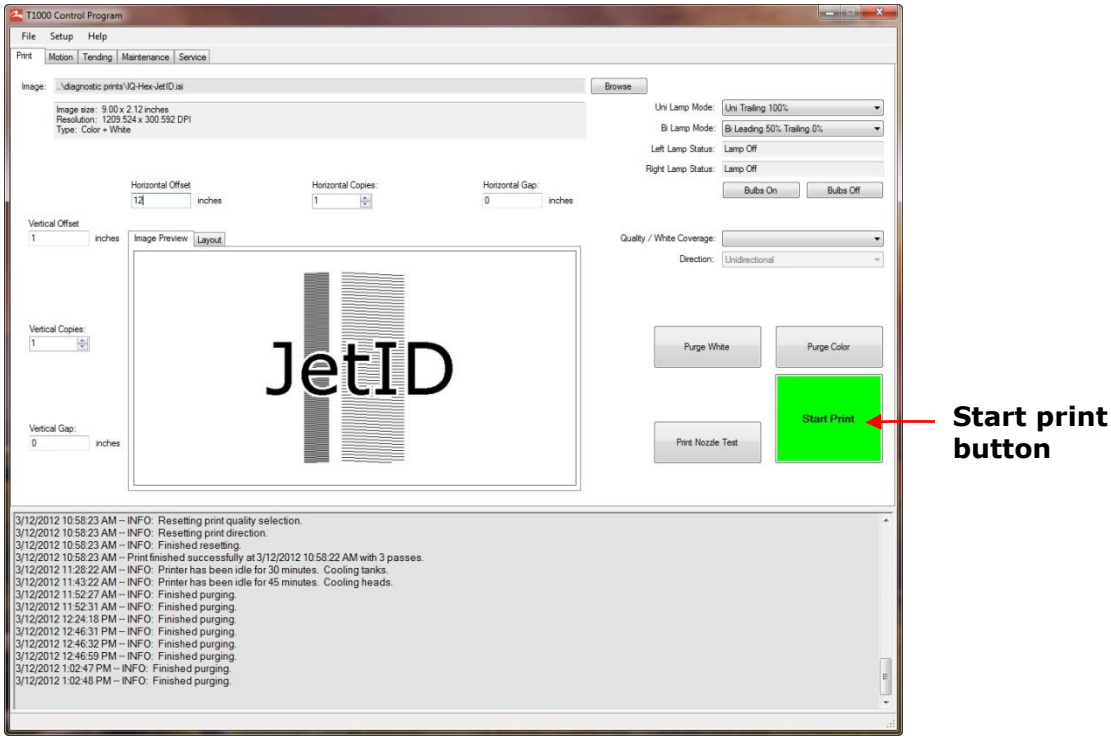


Figure 3: T1000 Control Program: Nozzle Test 1

4. Carefully evaluate the nozzle test print, shown in Figure 4, for indications of nozzle dropout.

Note: If the rectangles in the test print appear wavy, the head temperature may be unstable. Check that all printer settings are correct before continuing with the alignment procedures.

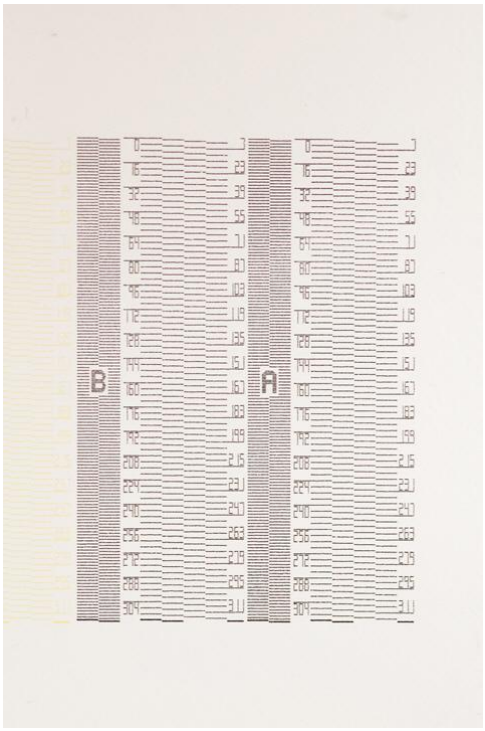
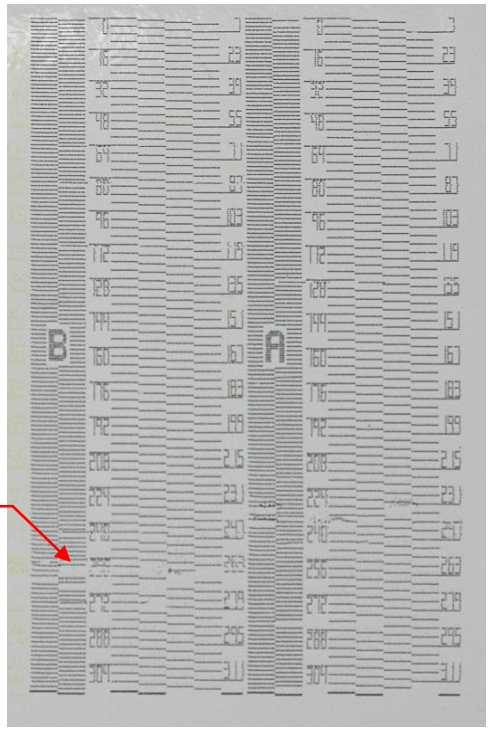


Figure 4: Good nozzle test print



Nozzle drop out

Figure 5: Bad nozzle test print

Head Rotation Alignment

The T1000 uses five separate dual row heads, one for each process color. The head rotation alignment ensures all print heads are parallel to each other and perpendicular to the motion of the carriage. Even the slightest misalignment will produce noticeable color banding.

1. Navigate to **C:\Program Files\T1000\1.0.1.XXXX\diagnostic prints**. The list of alignment files shown in Figure 6 is displayed.

   Note: Choose the latest file version as indicated by the example filename *1.0.1.XXXX*.

2. Choose the **T1000_Head_Rotation_CMYK.ism** or **T1000_Head_Rotation_WW.ism** from the test prints list. Print the image (Figure 7).

   Note: As stated in Alignment Procedures introduction, both CMYK and White files need to be printed and evaluated.

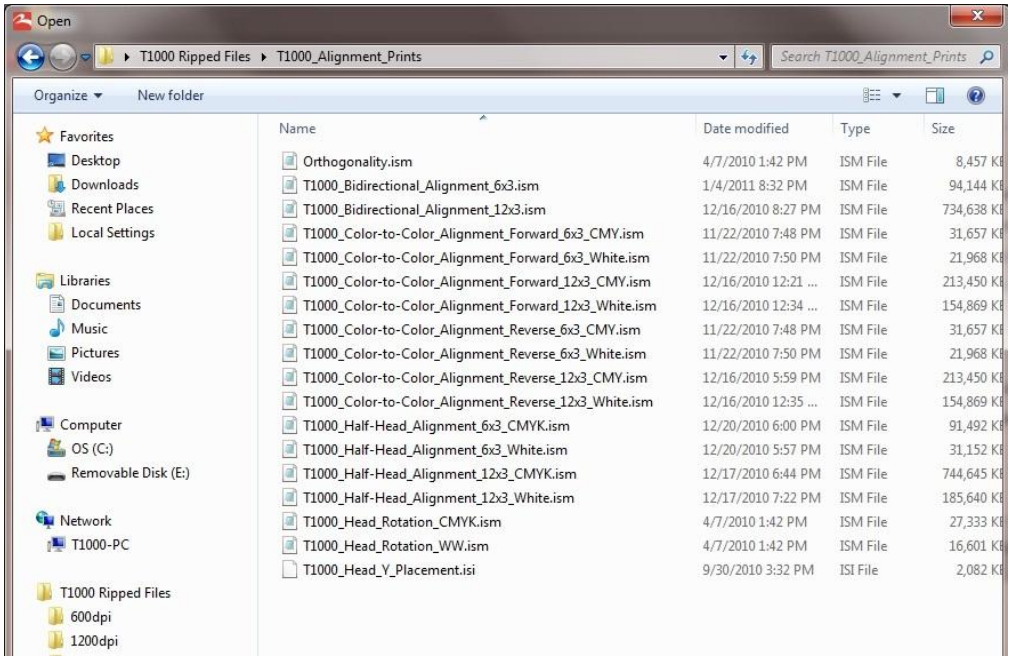


Figure 6: Navigate to test prints list

3. Closely examine the head rotation alignment print to ensure that the vertical lines are laying one on top of another to form a continuous straight vertical line. If the value of the line is not zero, read the value to adjust the Y rotation.
4. If an adjustment is needed, perform the following steps (refer to Figure 1).
   A. Loosen the two **head rotation lock screws** (item 2) located at the front of the print head mounting bracket. Using an Allen wrench, apply firm, even force but do not "jerk" the screw loose.
   B. Turn the **head rotation adjustment screw** (item 1) approximately the distance indicated by the close up image shown in Figure 8.
   C. Tighten the **head rotation lock screw** after the adjustment is complete.

D. Reprint and check adjustment.
E. Repeat steps A-D as necessary.

Note: The print head is anchored at the back to create a pivot point for adjustments.

- Clockwise adjustment of the screw will pivot the front of the print head to the left.
- Counter-clockwise adjustment of the screw will pivot the front of the print head to the right.

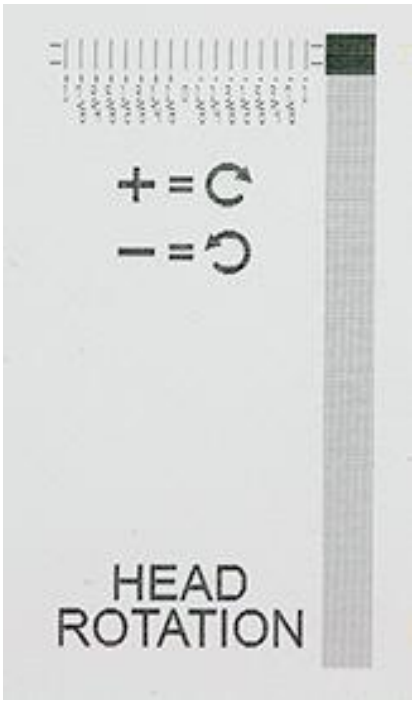


Figure 7: Head rotation-test print one color

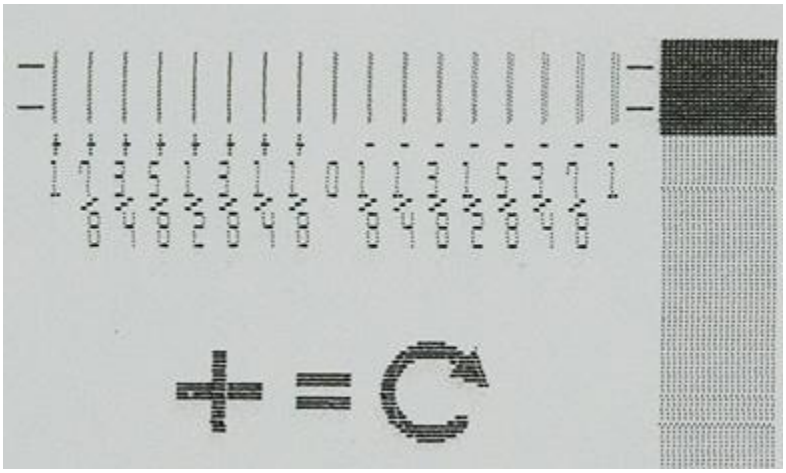


Figure 8: Head rotation close up

Orthogonality

1. Open the **Orthogonality.ism** file in the test file list. Print the image.
2. Measure diagonally from A to A and from B to B. Use a metal tape measure with a length of at least 36 inches.
3. If the dimension from A to A is larger than the dimension from B to B, decrease the orthogonality. If the dimension from A to A is smaller than the B to B dimension, increase the orthogonality.
4. Shift the image, then reprint and re-check.

Note: It may be helpful to have a second person available to help with the orthogonal measurement.

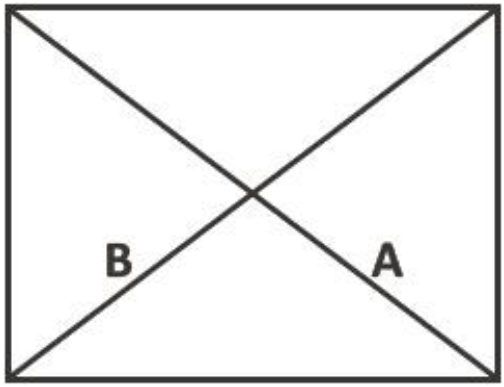


Figure 9: Orthogonality perfect (A=B, 500)

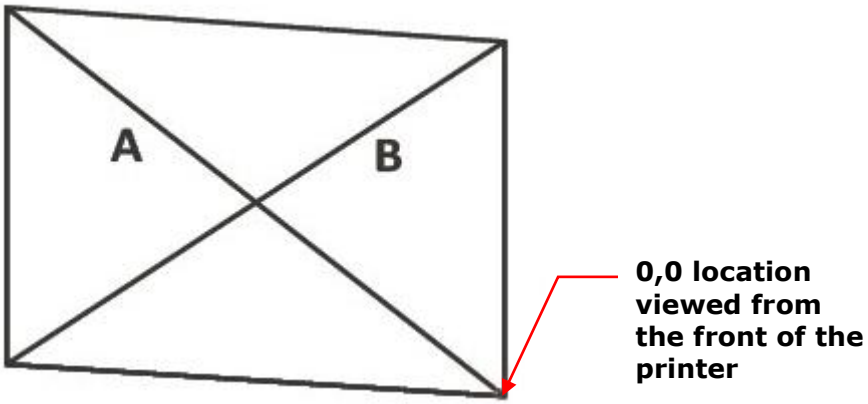


Figure 10: Orthogonality Out (A>B, Subtract from ortho number)

If A is longer than B, Subtract the value. Try decrements or increments of 500 to start, less to dial it in. Repeat as necessary.

Note: Make sure you measure each diagonal each time. Sometimes one of the diagonals might not change, so be sure to check both.

Note: Enter a number greater than 300 microns for minimal adjustment.

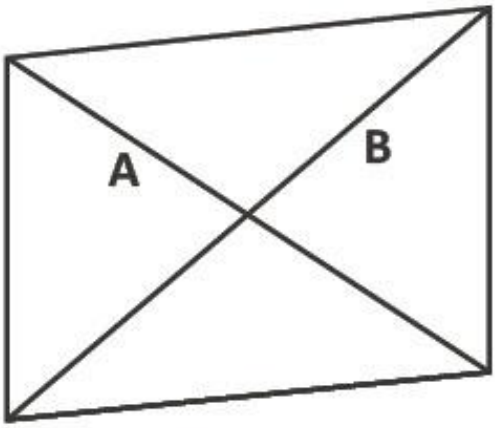


Figure 11: Orthogonality Out (A < B, Add to ortho number)

Head Y Placement

1. Select the image **T1000_Head_Y_Placement.isi**.
2. Inspect each color pair- black is always the reference point. Adjust so that the color is aligned with the black line.
   A. Loosen the two **head "Y" placement lock screws** (item 4) located at the front of the print head mounting bracket. Using an Allen wrench, apply firm, even force but do not "jerk" the screw loose.
   B. Turn the **head "Y" placement adjustment screw** (item 3) *clockwise* if CMY lines are *in front of* the black lines, and *counterclockwise* if CMY colors are *in the rear of* the black lines.
   C. Tighten the **head "Y" placement lock screws** (item 4) after the adjustment is complete.
   D. Reprint and check adjustment.
   E. Repeat steps A-D as necessary.
3. After adjustment, reprint and re-verify.

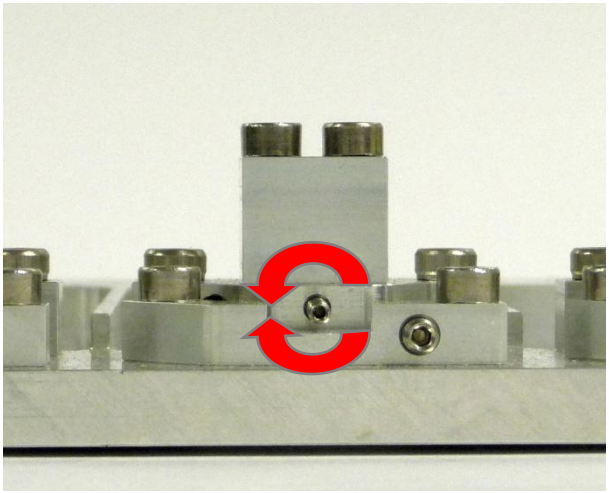


Figure 12: Head "Y" Adjustment Screw

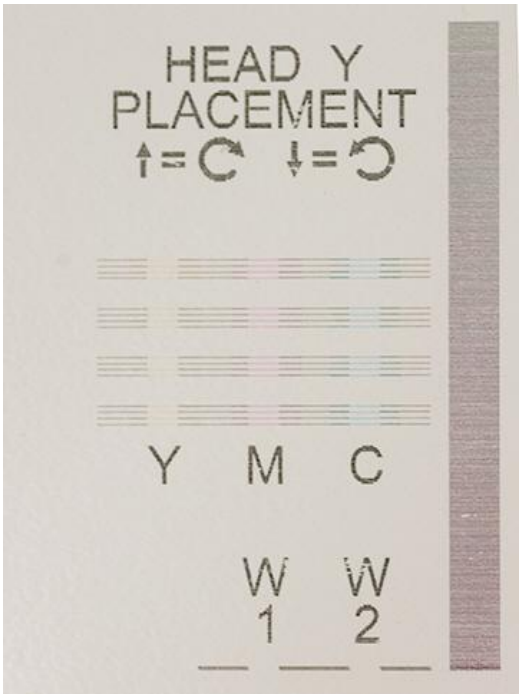


Figure 13: T1000_Head Y Placement.isi

All the software settings must be placed in the head alignment table on the T1000 control panel, shown in Figure 14. This panel is accessed by using the **Setup>Align Heads** menu pull down. When this panel is visible, select the proper resolution for the alignment being performed:

- 6 x 3 = **604.762 x 300.592**
- 12 x 3 = **1209.524 x 300.592**

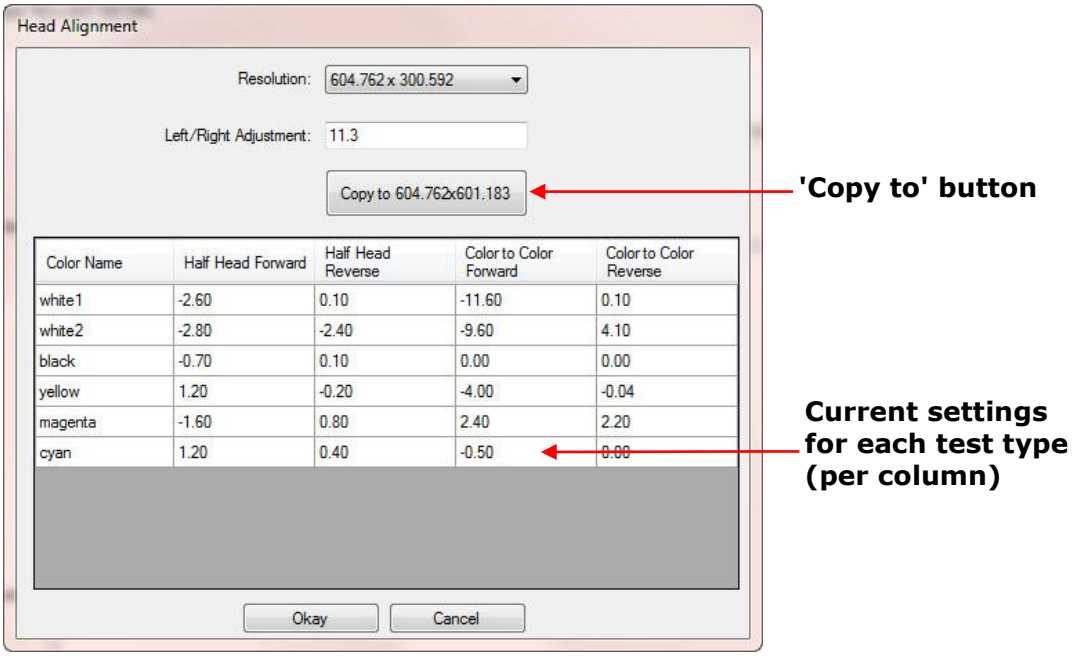


Figure 14: Head alignment table

6 x 3 Forward and 6 x 3 Reverse

1. Select **T1000_Half Head Alignment_6x3_CMYK.ism** or **T1000_Half Head Alignment_6x3_White.ism** from the file list. Print the image.

   Note: As stated in Alignment Procedures introduction, both CMYK and White files need to be printed and evaluated.

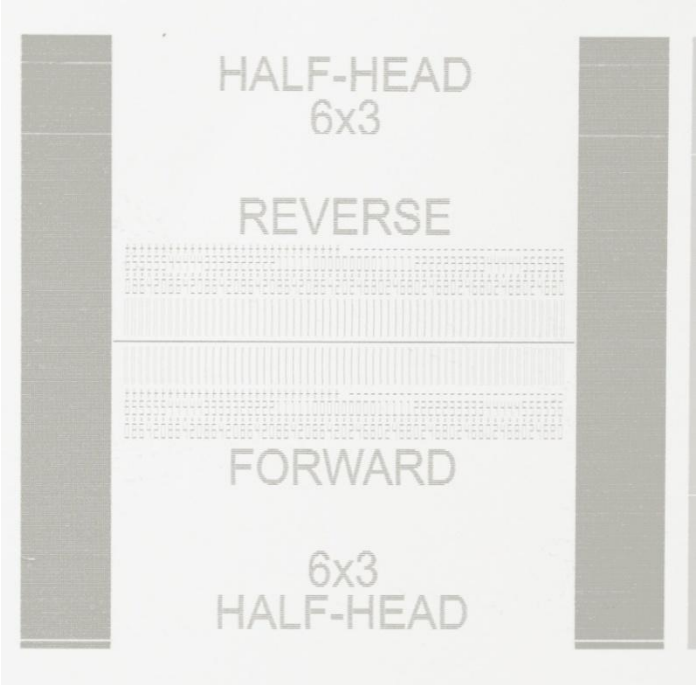


Figure 15: T1000_Half Head Alignment_6x3_CMYK or W image

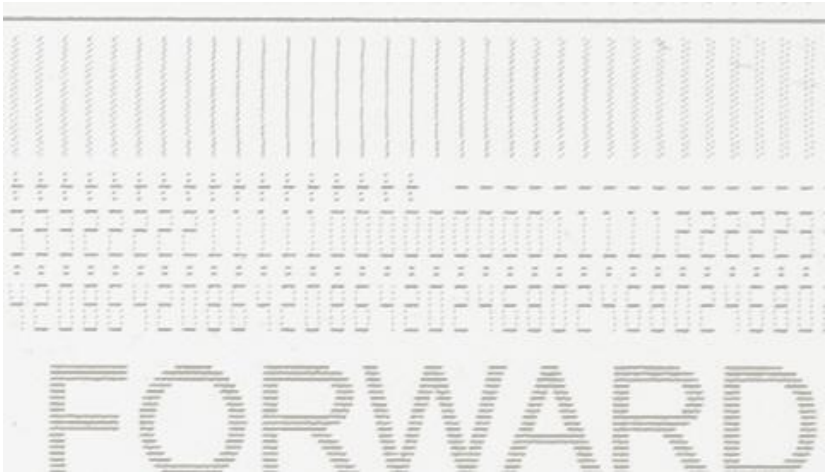


Figure 16: T1000_Half Head Alignment_6x3_CMYK or W

2. Inspect the half head target, select the line that is the "sharpest". Read the value of this color, and add the value to the current setting shown in the head alignment table (Figure 14).
3. Reprint to verify alignment.
4. Repeat for reverse settings. Enter in the proper column on the head alignment table.

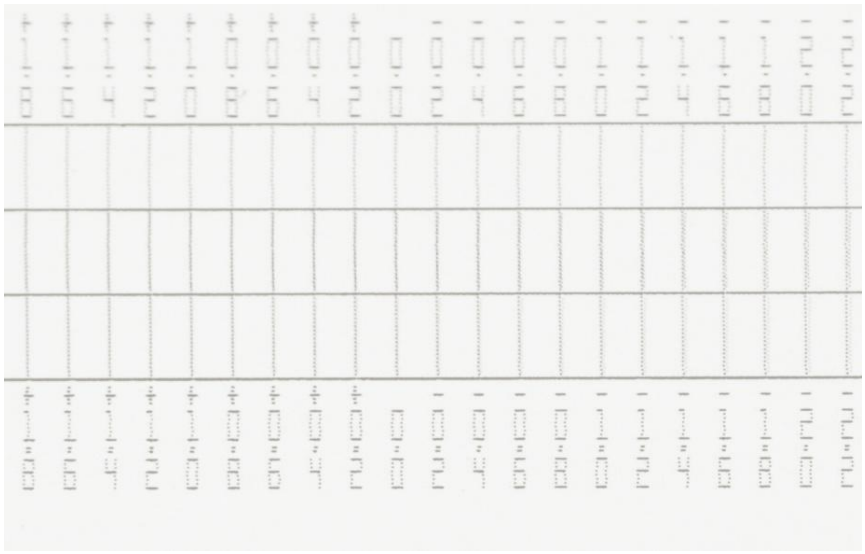


Figure 17: T1000_Half Head Alignment_6x3_CMYK or W close up

6 x 3 Color to Color

1. Select **T1000_Color_to Color_6x3_CMY.ism** or **T1000_Color_to Color_6x3_White.ism**. Print the image.
2. Inspect the color to color target. Select the line that is the "sharpest". Read the value of this color. Add this value to the current setting listed in the head alignment table.
3. Reprint to verify alignment.

   Note: As stated in Alignment Procedures introduction, both CMY and White files need to be printed and evaluated.

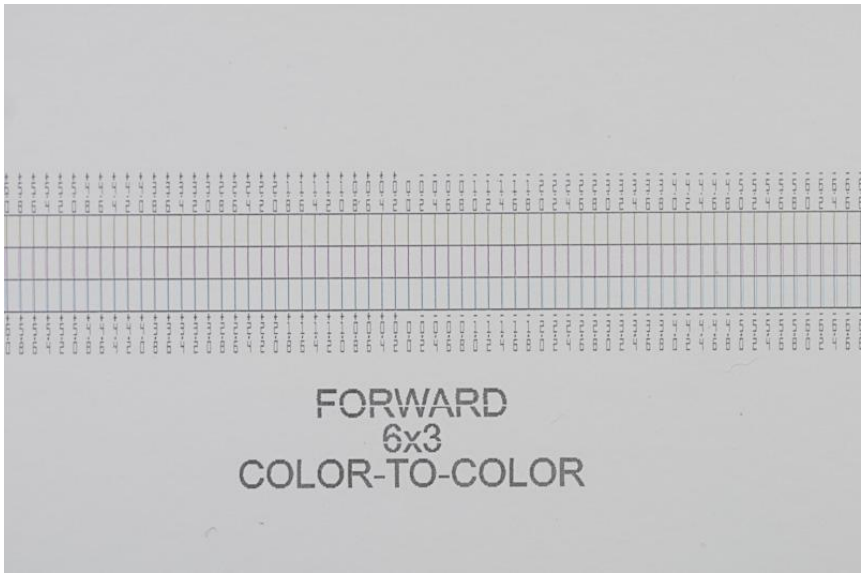


Figure 18: T1000_Color_to Color_6x3 Forward

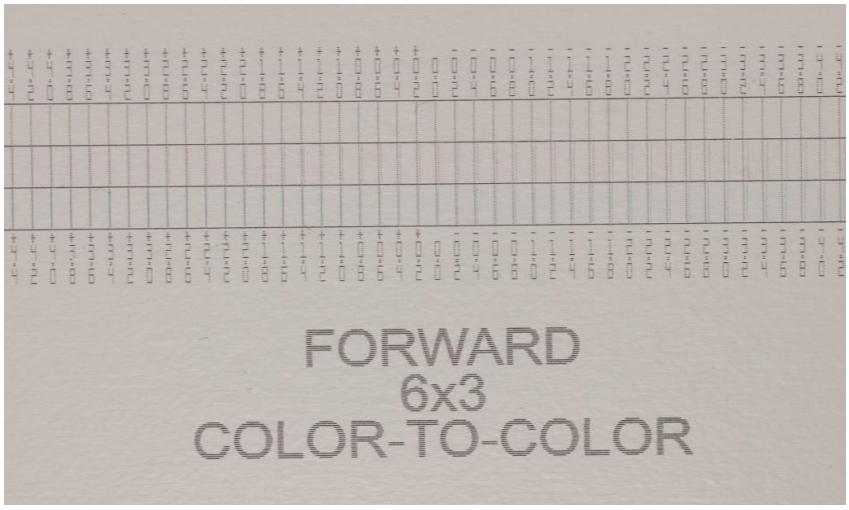


Figure 19: T1000_Color_to Color_6x3 Close up

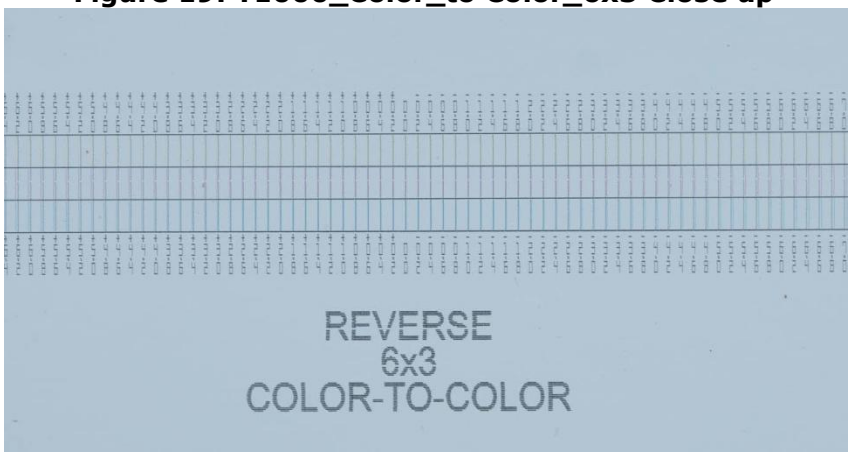


Figure 20: T1000_Color_to Color_6x3

6 x 3 Bidirectional Alignment

1. Select the **T1000_Bidirectional_Alignment_6 x 3.ism** file. Print the image.
2. Inspect the image. Determine the sharpest, straightest line. Enter this value as a correction to the number in appropriate column in the alignment table.

Note: If not all the lines are "off" by the same amount, this indicates that some of the previous alignments are not correct, and will need to be re-performed. The bidirectional alignment has only one setting to adjust all colors. All the colors must have the same error, or the image will not be correct.

3. When you have verified that all the 6 x 3 Half Head (forward and reverse), Color to Color (forward and reverse) and Bidirectional (left and right) alignments are correct, press the **Copy to 600x600** button, shown in Figure 14. This copies all the newly verified alignments to the 600 x 600 alignments.

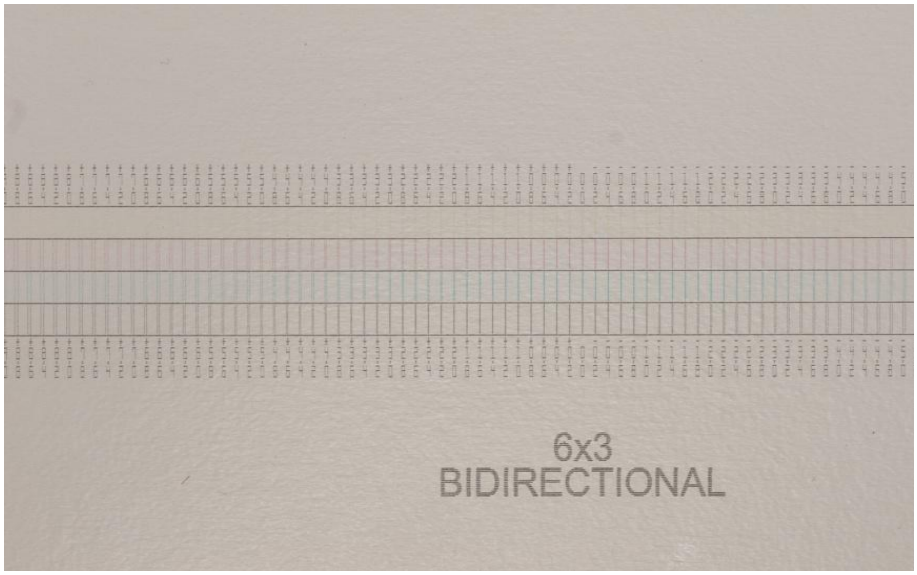


Figure 21: T1000_Bidirectional_Alignment_6 x 3.ism

12 x 3 Forward and 12 x 3 Reverse

1. Select **T1000_Half_head_Alignment_12 x 3_CMYK.ism** or **T1000_Half_head_Alignment_12 x 3_White.ism**. Print the image.
2. Inspect the half head target, select the line that is the "sharpest". Read the value of this color. Add this value to the current setting shown in the head alignment table.
3. Reprint to verify alignment.
4. Repeat steps 1-3 for reverse settings. Add all the values to the current setting listed in the head alignment table.

   Note: As stated in Alignment Procedures introduction, both CMYK and White files need to be printed and evaluated.

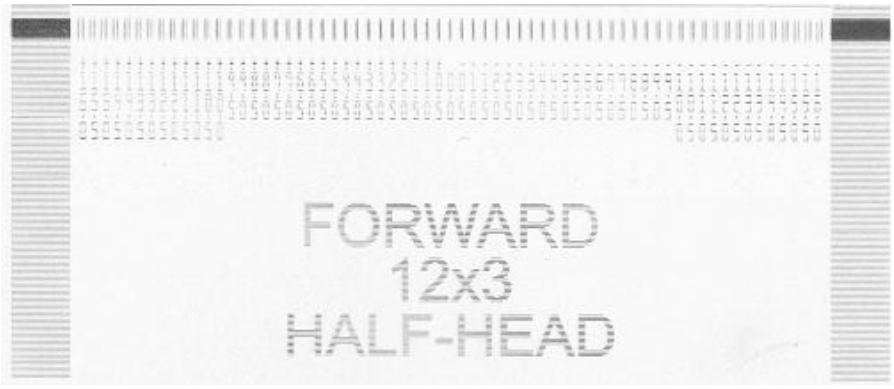


Figure 22: T1000_Half_head_Alignment_12 x 3_CMYK Forward

Figure 23: T1000_Half_head_Alignment_12 x 3_CMYK Reverse

12 x 3 Color to Color

1. Select **T1000_Color_to Color_12x3_CMY.ism** or **T1000_Color_to Color_12x3_White.ism**. Print the image.
2. Inspect the color to color target. Select the line that is the "sharpest". Read the value of this color. Add this value to the current setting listed in the head alignment table.
3. Re-print to verify alignment.

   Note: As stated in Alignment Procedures introduction, both CMYK and White files need to be printed and evaluated.

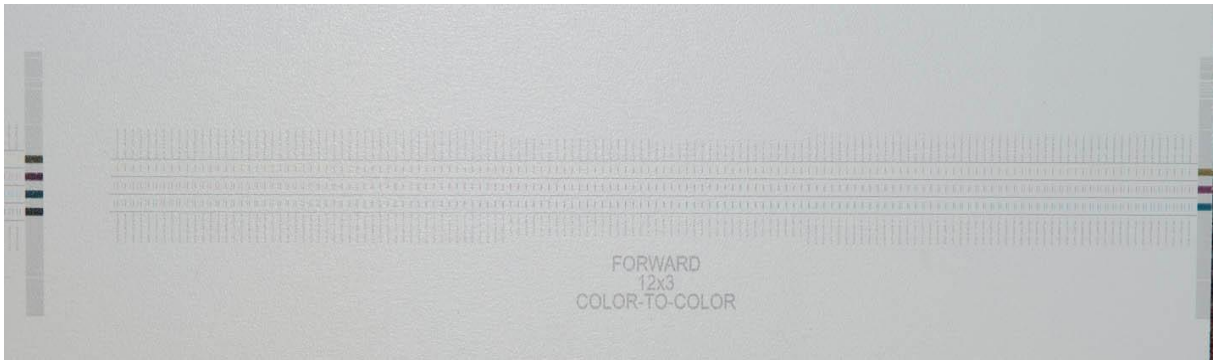


Figure 24: T1000_Color_to Color_12x3

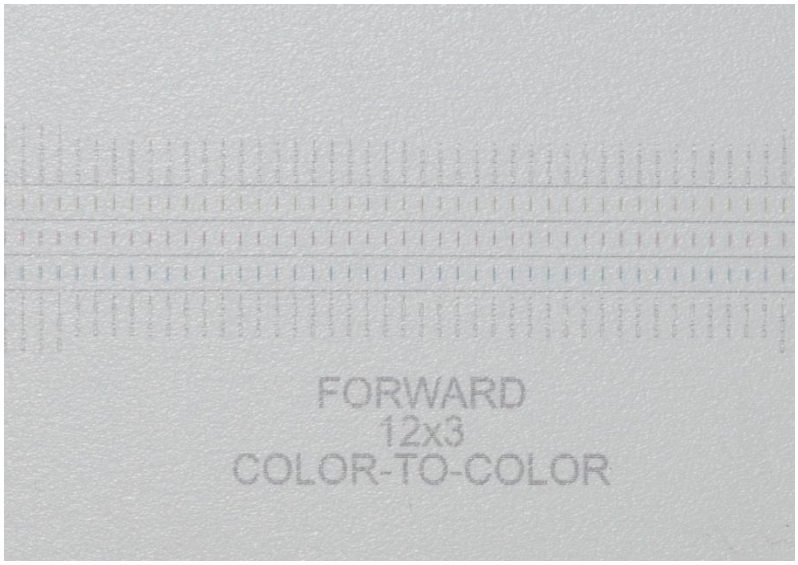
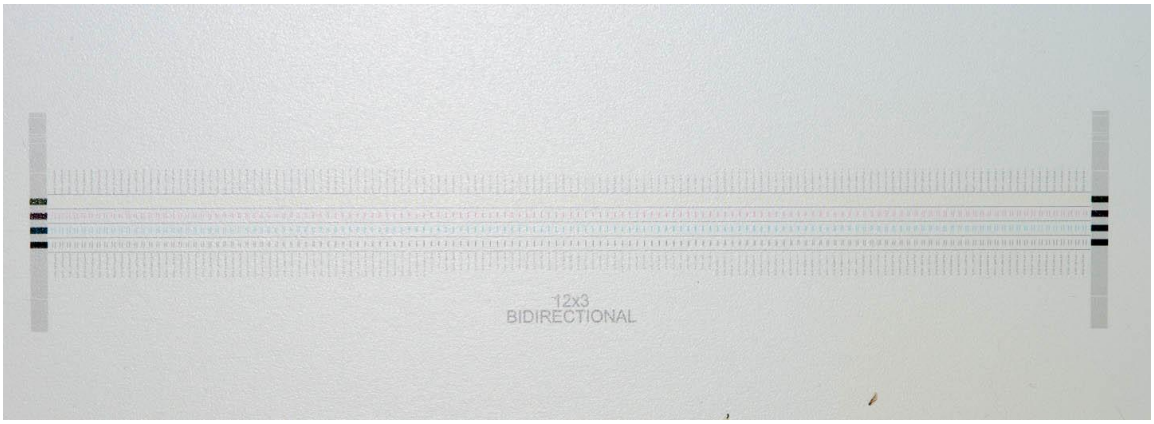


Figure 25: T1000_Color_to Color_12x3 Close up

12 x 3 Bidirectional Alignment

1. Select the **T1000_Bidirectional_Alignment_12x3.ism** image file. Print the image.



2. Figure 26: T1000_BidirInspect the image. Determine the "sharpest" straight line. Enter this value as a correction.

3. When you have verified that the 12 x 3 Half Head (forward and reverse, Color to Color (forward and reverse) and Bidirectional (left and right) alignments are correct, press the **Copy to 1200 x 900** button, shown in Figure 14. This will copy all the newly verified alignments to the 1200 x 900 alignments.

Note: If not all the lines are "off" by the same amount, this indicates that some of the previous alignments are not correct, and will need to be re-performed. The bidirectional alignment has only one setting to adjust all colors. All the colors must have the same error, or the image will not be correct.