Adjustments

5

Introduction

This chapter explains how to adjust the scanner for optimal scanning-quality. It describes the adjusting procedures in detail and provides additional information regarding wrong and right.

A general concept when adjusting the scanner is to loosen screws just slightly. If you loosen the screws too much, you will have difficulties controlling the adjustments, because of too much play in the adjustment levers and other adjustment points. Unless this chapter states otherwise, always loosen screws and nuts **only** slightly.

Terminology

Throughout this chapter a number of visual elements will be used to guide you through the adjustment process.

The exclamation mark will be used to point out possible sources of errors. If something can go wrong when doing a specific action, this visual item will describe it.

Thumps up will be used with hints, tips and tricks that make a specific action easier to complete.

A hand in an illustration means that this particular adjustment does not require a tool. It can be adjusted with your fingers.

A screwdriver in an illustration means that this particular adjustment requires a tool. It can't be adjusted with your fingers alone.

Text in **bold** describes a mechanical part, an item or a program button, which can be located in one of the illustrations.

**hp** designjet scanner series service manual

Camera Design

Introduction

The hp designjet scanner uses 2 cameras, where each camera scans its own part of the image.
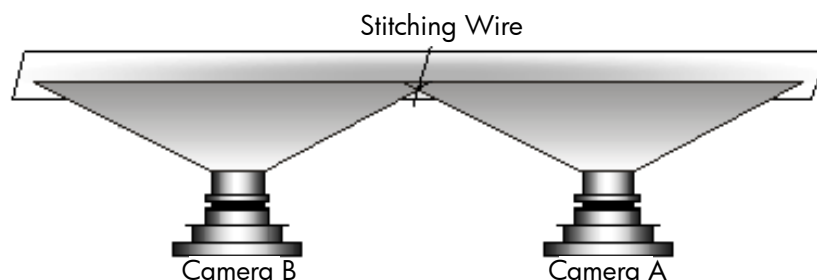

The cameras are named A to B and when positioned in the scanner, Camera A is on the right (the one closest to the Operator Panel).

The cameras scan-area overlaps to ensure that the scanner scans the complete image. Most of the scanner adjustments are focused on getting the correct Scan-Width. The adjustment ensures that a camera scans the right amount of image data so that the basic DPI resolution of the camera is precise. This fine-tunes the accuracy of the scanner. A metal wire (**stitching wire**) in the overlapping area helps the scanner to adjust the cameras electronically.
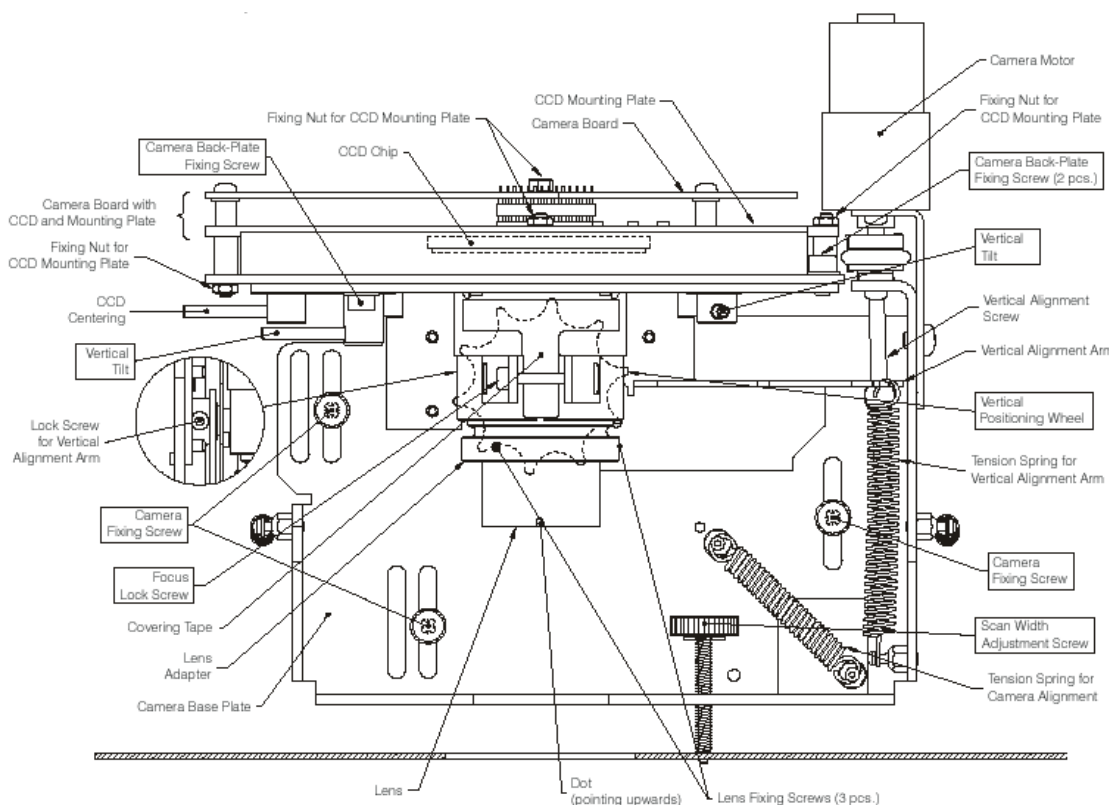
The following picture shows how the camera actually looks like. Only Camera A has a motor at the rear (Camera B does not have a motor).
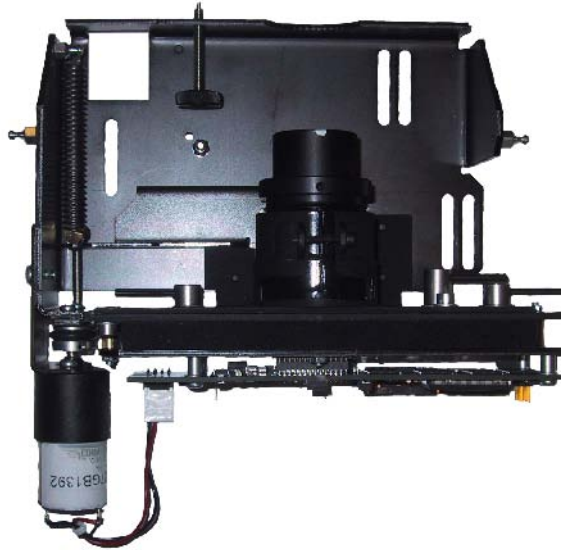

The CCD Element

The central component of the Camera is the Sony CCD (Charge Coupled Device) element, which is responsible for capturing the colors reflected from the original image.


The CCD is formed as a chip, and is inserted into a standard dual in-line socket just like a normal chip. The chip has 3 rows each containing 10000 pixels.

The 3 rows each scan a different color. Combined, the 3 rows provide 24 bit color. Each CCD pixel is formed as a square with a side length of 4 mm. There is 32 mm between adjacent lines.
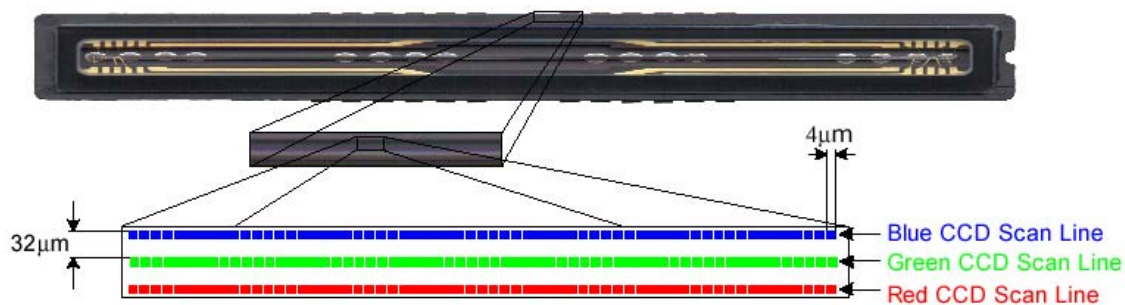
Camera Board Adjustments

The **Scan-Width Adjustment Screw** moves the camera backwards and forwards, which influences the Scan-Width of the camera.


Scan Width
Adjustment
Screw
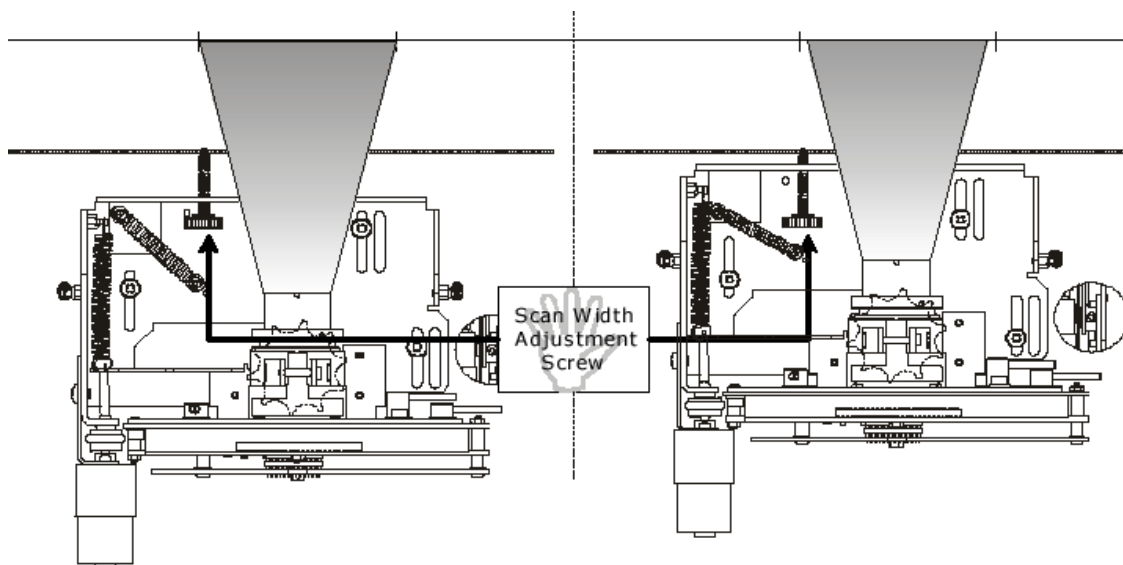
When the **Scan-Width Screw** is screwed all the way in, as illustrated on the left side of the above picture, the camera has the maximum possible scan-width. When it is screwed all the way out (right side of picture), the camera has the smallest possible scan-width.
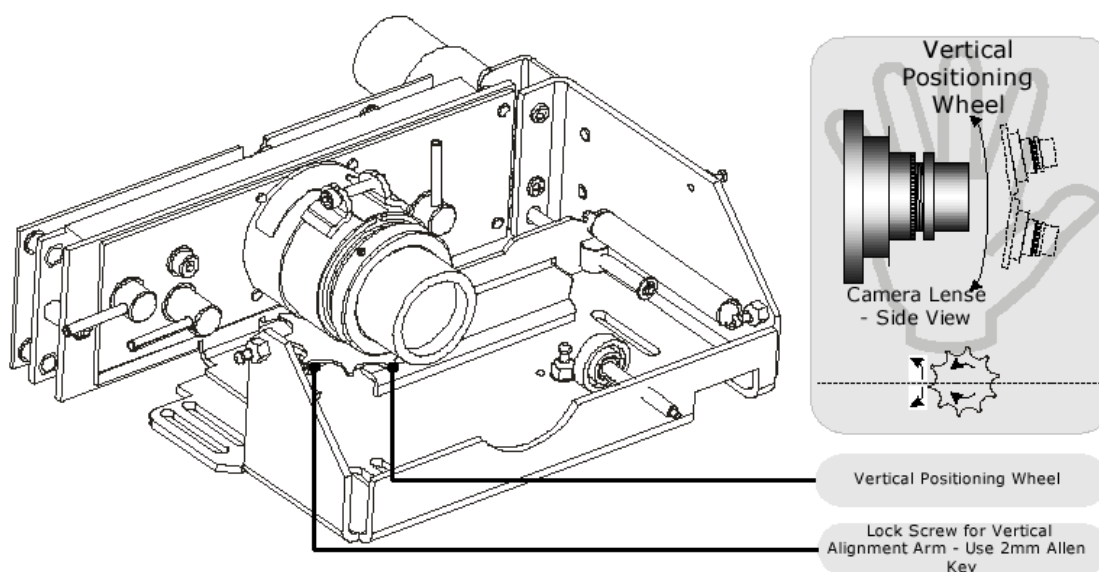
The **Scan-Width Screw** is only fixed on the camera itself and not on the scanner chassis. This means, that when screwing the screw backwards, you have to push the camera forward manually to decrease the scan-width. When screwing forward, the screw will push the camera backwards on it's own.

The CBE Camera Board, where the CCD is placed, can be moved relative to the camera using 3 adjustment levers.

Camera board
seen from the
back

Vertical Tilt - Left

Vertical Tilt - Right

CCD-Centering
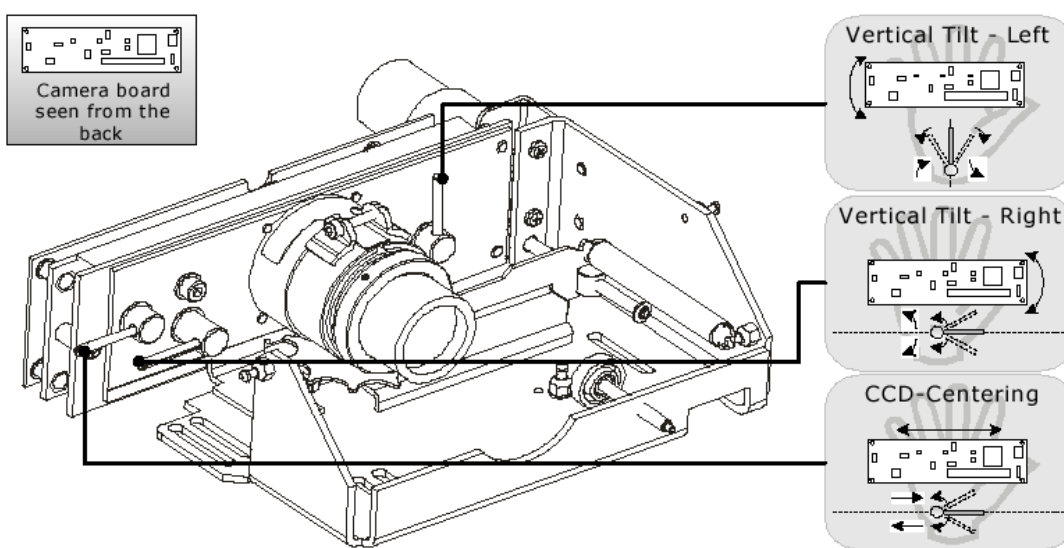
This is an easy and quick way of adjusting the camera, as it does not involve moving the camera itself, but only the camera board, which can be done very precisely.

■ Vertical Tilt – Left: moves the left upper edge of the **CCD Mounting Plate** and the **CBE Camera Board** up and down, making the field of vision tilt in proportion to the horizon.

■ Vertical Tilt – Right: moves the right upper edge of the **CCD Mounting Plate** and the **CBE Camera Board** up and down, making the field of vision tilt in proportion to the horizon.

■ CCD Centering: moves the **CCD Mounting Plate** and the **CBE Camera Board** horizontally left and right and thereby making the field of vision move horizontally left and right.

Vertical Positioning Wheel

Camera Lense - Side View

Vertical Positioning Wheel

Lock Screw for Vertical Alignment Arm - Use 2mm Allen Key

The camera itself can be tilted up and down which causes the field of vision to move up and down. The **Vertical Positioning Wheel** is used for coarse adjustments and the **Vertical Alignment Screw** is used for finer adjustments. When you turn The **Vertical Alignment Screw** clockwise you raise the camera and the field of vision and vice versa. The **Vertical Positioning Wheel** works opposite of the **Vertical Alignment Screw**.

When using the **Vertical Positioning Wheel**, loosen the **Lock Screw** first, so that **Vertical Alignment Arm** doesn't move simultaneously. You will normally not adjust directly on the **Vertical Alignment Screw**, but instead via an extension and through a hole in the scanner front.

Preparing the Scanner

Before you start make sure that you have the following items, which are necessary to complete the Camera Adjustment:

■ The SCANtest6 is installed in the touch screen (programs - Scanner Test Program - Scantest 6).

■ Focus Adjustment Pattern sheet (included in the Service Patterns pn Q1261-60037).

■ Optical Adjustment Pattern (pn Q1261-60038).

Make sure that the scanner you are adjusting is fully functional. If the scanner is not operational, you will not be able to adjust the camera.

Adjusting the Camera Using the Camera Wizard

Make sure that the left and right covers are installed and the top cover is removed. The scanner and the touch screen must be switched ON.

The first thing to be done before adjusting the camera that has been replaced is to ensure that the camera is at least looking in the right direction.

1 Make sure that camera is completely installed and all cables are correctly connected.

2 Select button **27. Camera Adjustment Wizard** in SCANtest 6.
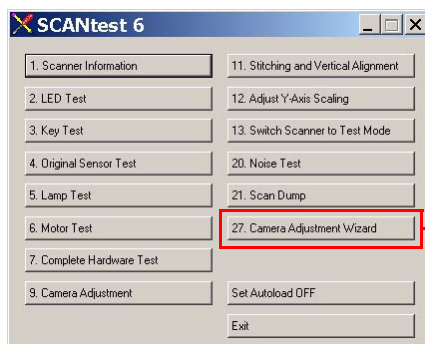
Select button 27

3 The Camera Adjustment Wizard will start with the welcome screen. Select **next** to contine.
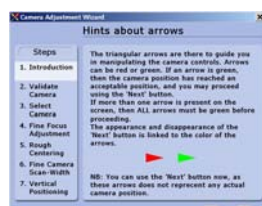

Select next to continue

4 The screen will display the list of Service Tools necessary to complete the Camera Adjustment correctly. Select **next** to continue.
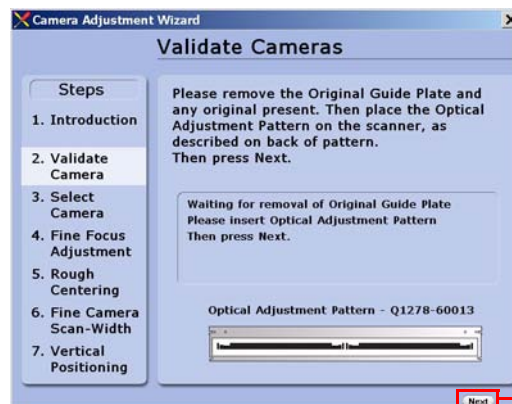

Select next to continue

5 The next 4 screens contain information on how to perform the camera Adjustment correctly. Select **next** after reading each screen.


6 In order to validate the current state of the cameras you will need to remove the Original Guide Plate and place the Optical Adjustment Pattern on the Scanner. Align the pattern by pressing it to the right towards the Operator Panel and backwards towards the back of the scanner. Once the cameras have been validated, select **next** to continue.

Select next to continue
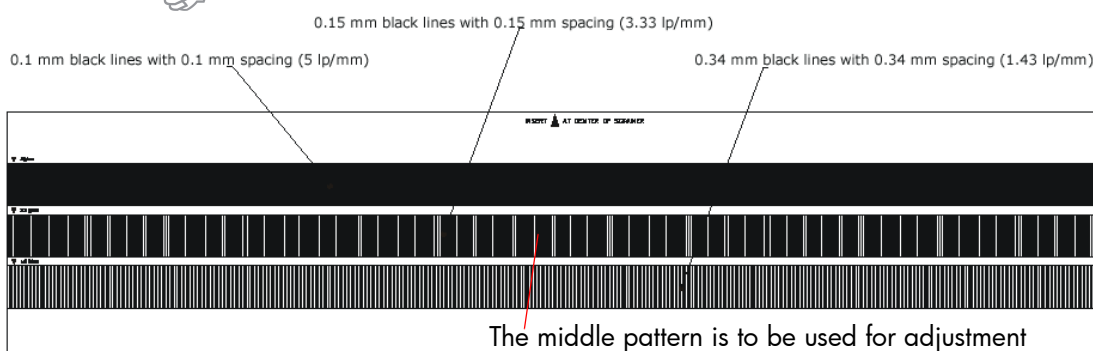
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7 The Scanner will now perform some internal adjustments. In order to do this you will need to remove the Optical Adjustment Pattern and place the Original Guide Plate on the Scanner.
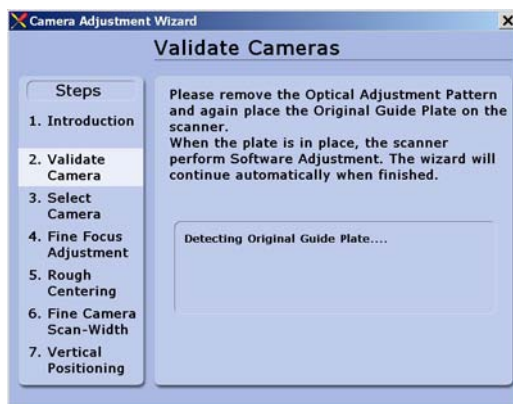

8 Once the internal adjustment has been done, you will need to insert the Focus Adjustment Pattern in the Scanner.

It's best to insert the left corner of the Focus Adjustment Pattern first and then slide the right side of the pattern in to place.

0.15 mm black lines with 0.15 mm spacing (3.33 lp/mm)

0.1 mm black lines with 0.1 mm spacing (5 lp/mm)

0.34 mm black lines with 0.34 mm spacing (1.43 lp/mm)

The middle pattern is to be used for adjustment

9 Once the Scanner detects that the Focus Adjustment Pattern is correctly positioned you will be able to select **next** to continue.
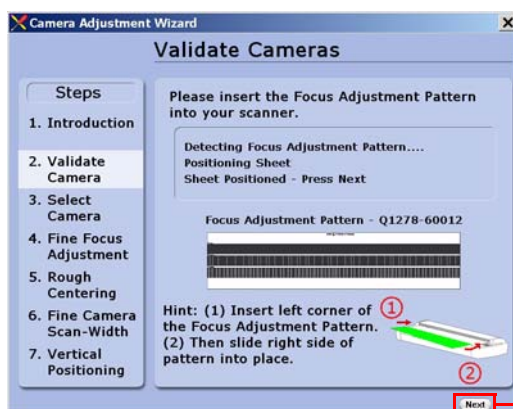

Select next to continue (when it appears)

10 Select the camera that you would like to adjust by touching inside one of the red squares. Camera A is the one on the left hand side (the one closest to the Operator Panel).
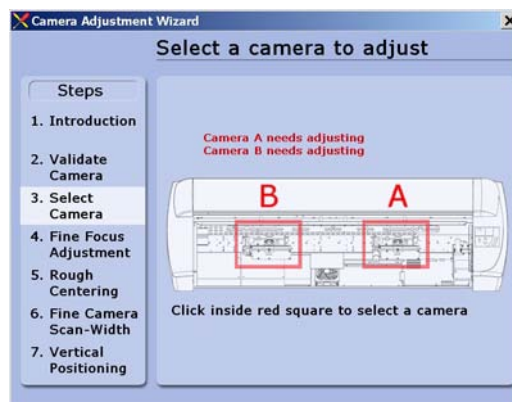

11 Remove the Focus Adjustment Pattern and the Original Guide Plate and place the Optical Adjustment Pattern on the Scanner. Align the pattern by pressing it to the right towards the Operator Panel and backwards towards the back of the scanner. Once the pattern has been detected, select **next** to continue.
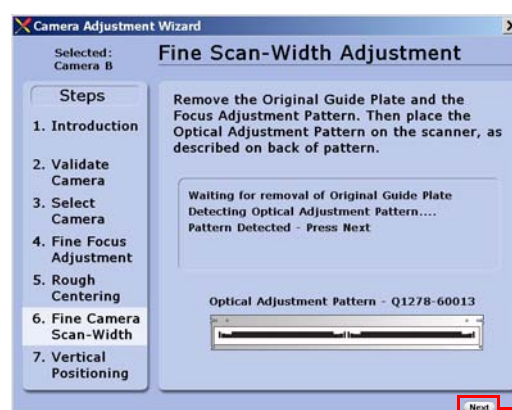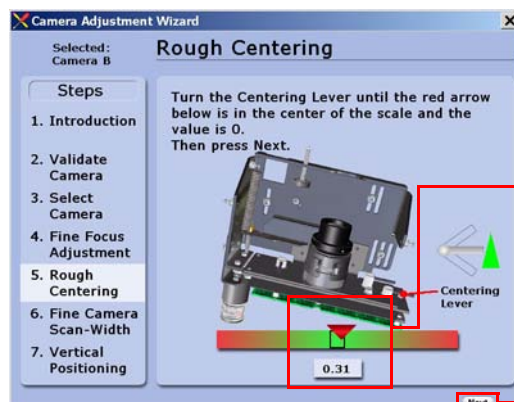

Select next to continue

12 Camera analysis requires partial adjustment before completion. Loosen the **3 Camera Back-Plate Fixing Screws** and then select **next**.
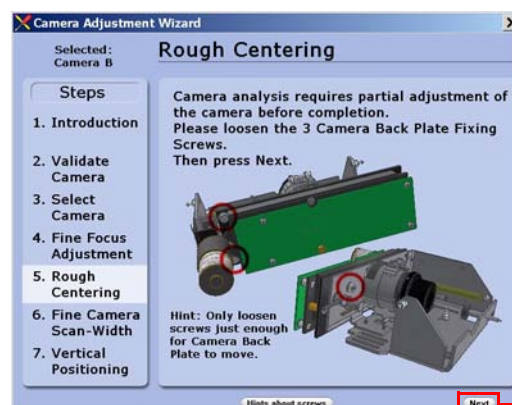
Select next to continue

13 Turn the **Centering Lever** until the arrow on the screen is in the center of the scale and the value is 0 (or as close as possible). Once the value is 0, you will be able to select **next** to continue.
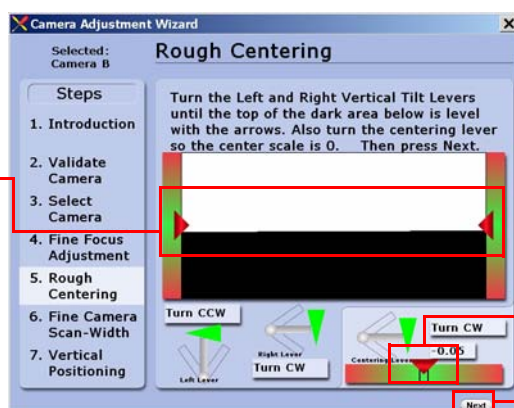

The arrow needs to be in the center and the value 0

Select next to continue (when it appears)

14 Turn the **Left and Right Vertical Tilt Levers** until the horizon is in level with the arrows. Also turn the Centering Lever so the center scale is 0. Once the value is 0 and the horizon is in level with the arrows, you will be able to select **next** to continue.

The horizon needs to be in level with the arrows

The arrow needs to be in the center and the value 0

Select next to continue (when it appears)

15 Tighten the **3 Camera Back-Plate Fixing Screws** and then select **next**.

Select next to continue

16 Loosen the **Camera Fixing Screws** slightly so that the camera housing can be moved. Select **next** to continue.

Select next to continue

17 Turn the **Scan-Width Screw** until the arrow on the screen is in the center of the scale and the value is 6.0. Once the value is 6.0, tighten the **Camera Fixing Screws** while maintaining the correct adjustment. Once the screws are tightened, select **next** to continue.

The arrow needs to be in the center and the value 6.0

Select next to continue (when it appears)

18 Loosen the **Camera Back-Plate Fixing Screws** slightly so that the camera housing can be moved. Select **next** to continue.

Select next to continue

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19 Turn the **Left and Right Vertical Tilt Levers** until the horizon is in level with the arrows. Also turn the Centering Lever so the center scale is 0. Once the value is 0 and the horizon is in level with the arrows, you will be able to select **next** to continue.
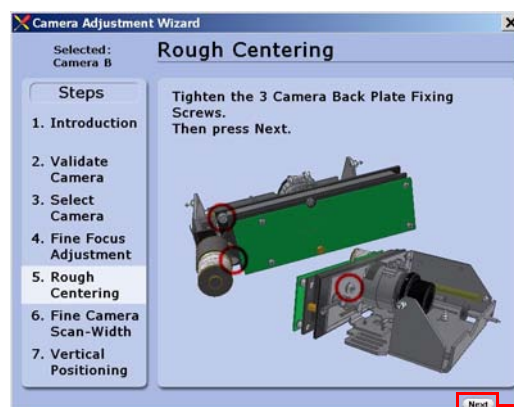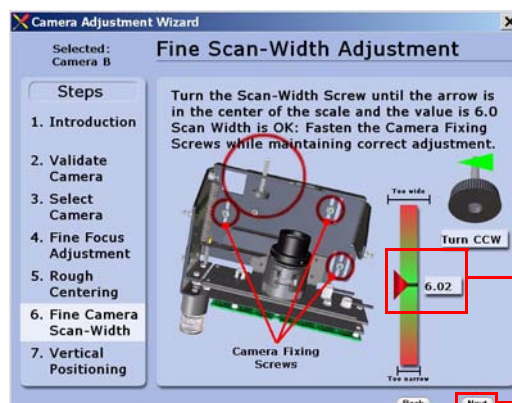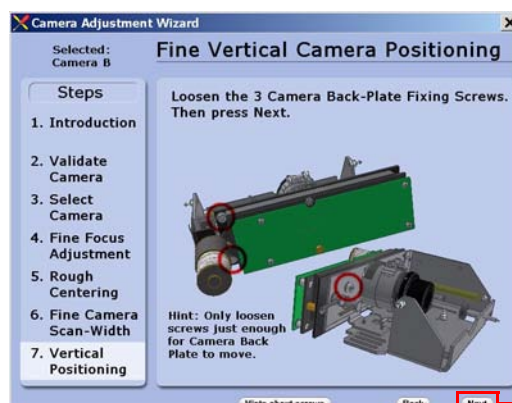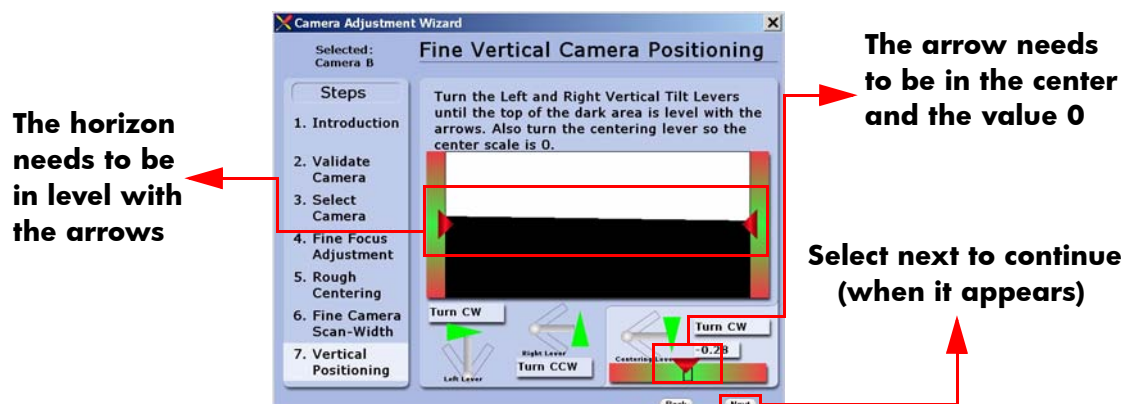

The horizon needs to be in level with the arrows

The arrow needs to be in the center and the value 0

Select next to continue (when it appears)

20 Tighten the **Camera Back-Plate Fixing Screws** gently to prevent the camera from moving out of adjustment. The Camera Adjustment has now been completed.

21 Perform the Scanner Maintenance to ensure that Color Calibration, Stitching and Vertical Alignment are correct.

Scanner Maintenance

Once the cameras are adjusted, you will need to adjust the whole scanner to fine-tune it by performing the Scanner Maintenance. Scanner Maintenance does the following three things **automatically**:

1 Runs Vertical Alignment, which adjusts the vertical position of the Cameras.

2 Adjusts the Stitching, which controls the overlap between the Cameras.

3 Color Calibrates the Scanner to get optimal colors and gray tones.

Performing Scanner Maintenance

For this part of the adjustments you will need the following item:

■ Scanner Maintenance Calibration Sheet 40" (included in the Service Patterns pn Q1261-60037).

1 Start by removing the **Optical Adjustment Pattern**, putting back the Original Guide Plate (after cleaning the scanning area) and finally place the top cover on the scanner again.

2 Exit the Camera Adjustment Wizard and exit SCANtest 6.

3 Wait for the Scanner to reboot and then start Scanner Maintenance when only the green lamp is lit up on the scanner keyboard.
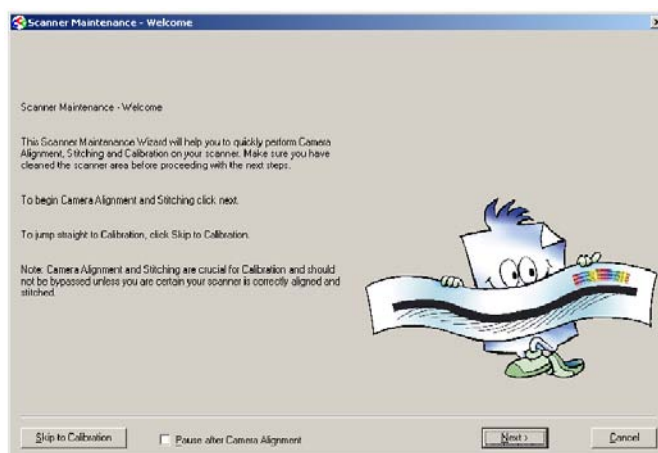
4 Insert the Scanner Maintenance adjustment sheet and press **Next** two times.

5 Wait for Scanner Maintenance to finish. It takes about 20 minutes.

6 Remember to put the calibration sheets back into the original packing, so that they last longer.

Adjusting the Camera Using Manual Procedure

⚠️ **This Chapter explains how to adjust Camera A, but the procedure is exactly the same for Camera B.**

Light Profile

Make sure that the left and right covers are installed and the top cover is removed. The scanner and the touch screen must be switched ON.

⚠️ When you install the scanner in the copier again the camera may be completely out of adjustment. If you get an Error 30 from SCANtest when setting the Light Profile to **Corrected**, start with **Uncorrected** and follow steps 3 and 4 as well as you can and then start over with the **Corrected Light Profile** again.

The first thing to be done before adjusting the camera that has been replaced is to ensure that the camera is at least looking in the right direction.

1 Make sure that camera is completely installed and all cables are correctly connected.

2 Select button **9. Camera Adjustment** in SCANtest 6.

3 A software oscilloscope is now activated and looks something like this:

Select the Reference Image button in order to view the Reference Image section

Reference Image
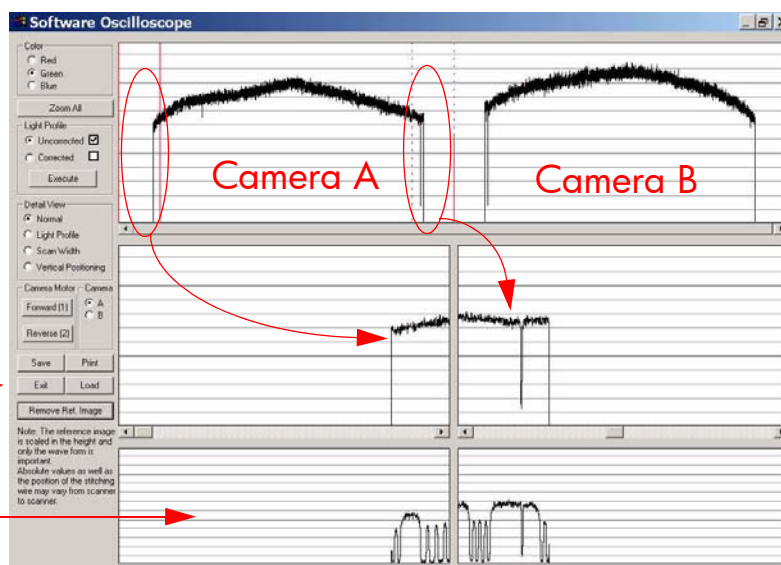
4 You see the uncorrected light profile, for Cameras A & B, that the copier receives from the reflection of the white background plate on the back of the original guide. Camera A is on the left, Camera B is on the right. You can zoom in with the buttons on the touch screen. You can see that the output is lower at the edges. This is because of the lens in the camera. If you get a screen that looks distorted in comparison with the above image, then your camera is maybe looking into the chassis instead of the mirrors in the copier. To correct this, loosen the **Lock Screw for Vertical Alignment Arm** and rotate the **Vertical Positioning Wheel** left or right until you get an

oscilloscope image similar to the one above. Remember to fasten the **Lock Screw for Vertical Alignment Arm** afterwards again.

Focus Adjustment

The first adjustment that you need to make is the focus. This adjustment ensures, that the camera has the right focus, so that the following adjustments aren't blurred out. The focus setting is not so sensitive to the following adjustments, which makes it perfect to start with. When you are finished with all the adjustments, you should check the focus again just to be sure that it's still OK.

1 Stay in the Software Oscilloscope and select **Corrected** and press the **Execute** button (make sure that the Blue Channel is selected).

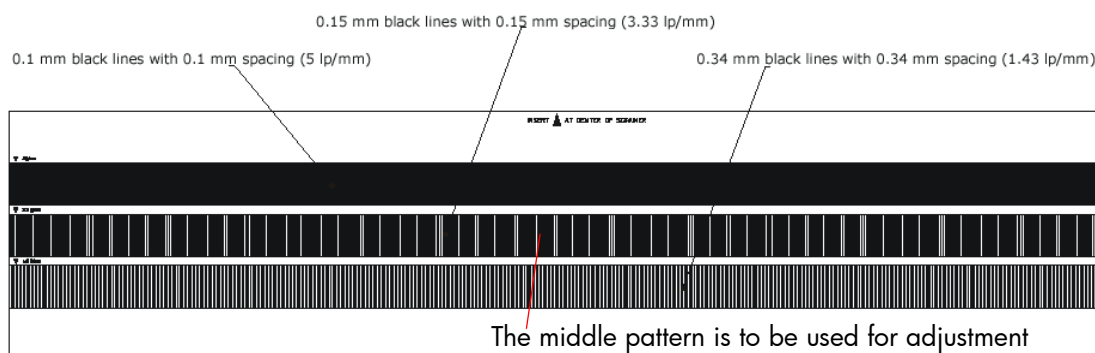**2** Wait approximately 90 seconds until SCANtest 6 is ready.
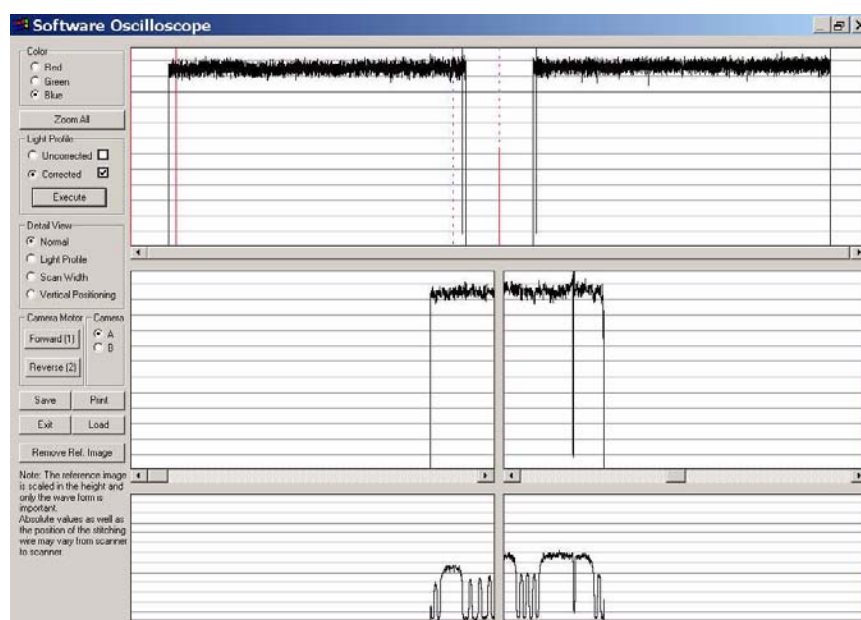
3 Insert the Focus Pattern in the scanner.

It's best to insert the sheet from the back of the copier and use the Reverse Key to position the pattern correctly. This way the sheet won't cover the cameras when you adjust them. It requires a little practice but makes the

focus adjustment a lot easier.

0.15 mm black lines with 0.15 mm spacing (3.33 lp/mm)

0.1 mm black lines with 0.1 mm spacing (5 lp/mm)   0.34 mm black lines with 0.34 mm spacing (1.43 lp/mm)

The middle pattern is to be used for adjustment

Use the operation panel keys to move the sheet so that the cameras see the 3.33 lp/mm pattern.

**4** Loosen the **Focus Lock Screw** and turn the **Lens Adapter** to adjust the focus.

Focus Lock Screw   Lens Adapter   Lens Fixing Screws   Lens
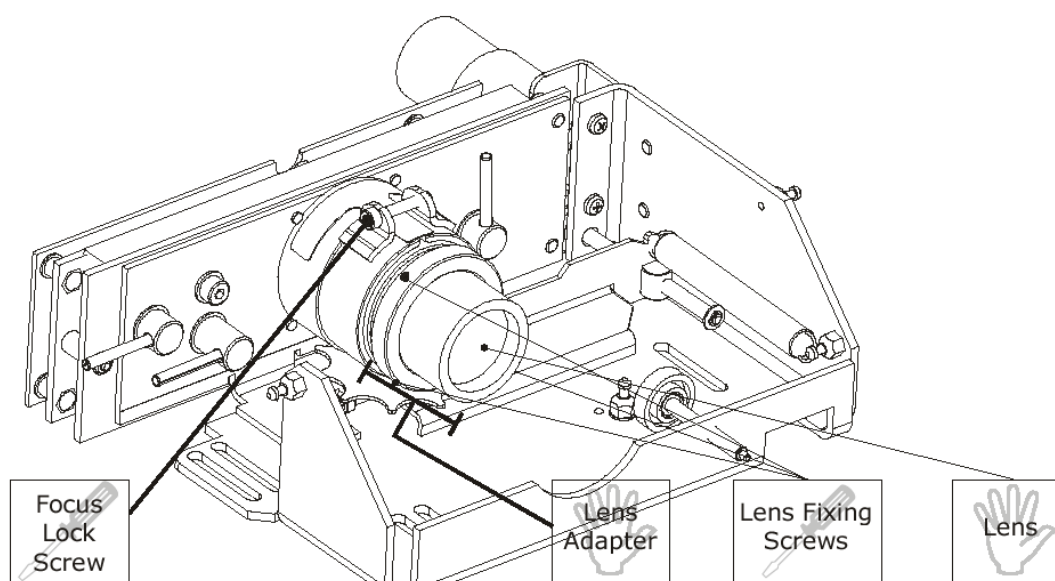
The Focus adjustment greatly influences the Scan-Width adjustment. Therefore the Scan-Width must be checked and readjusted if necessary when the Focus adjustment has been changed. On the other hand, the Focus adjustment is relatively tolerant to changes in the Scan-Width adjustment.

Loosen the **Focus Lock Screw** and ensure that it is not too loose. Turn the **Lens Adapter** until you get this picture on the software oscilloscope

(Camera A has been zoomed in):
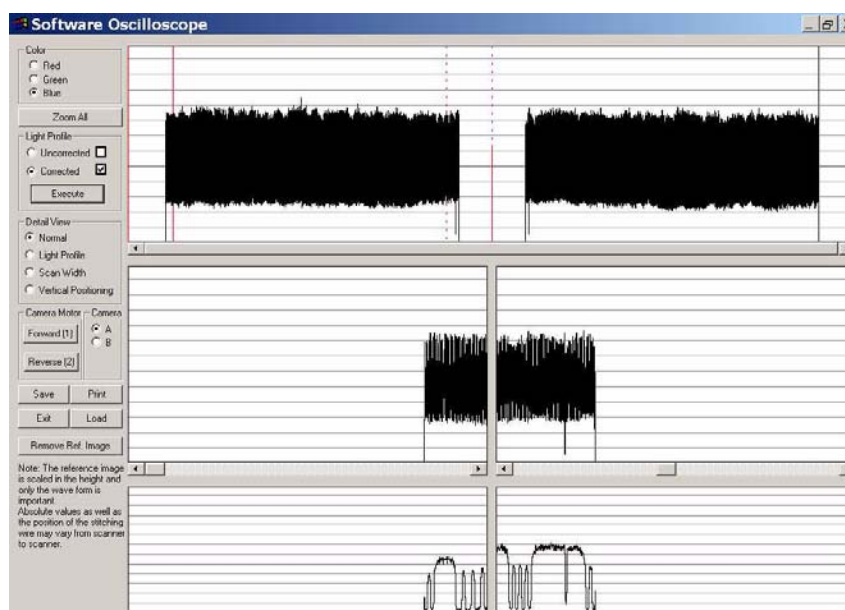
The signal has to be as even as possible and especially the ends have to be at their highest possible level.

When the focus is right, tighten the **Focus Lock Screw.**

There is a mark on every lens, which indicates its "best position". If you have completed the focus adjustments and this mark isn't pointing upwards, mark the upward position on the **Lens Adapter**. Turn the **Lens Adapter** and loosen the **Focus Lock Screw** and the three **Lens Fixing Screws** (with a 1,5 mm Allen key). Then turn the Lens so that the mark is pointing upwards, tighten the **Lens Fixing Screws** again. Turn the **Lens Adapter** back again and check that the focus it still correct before tightening the **Focus Lock Screw**.
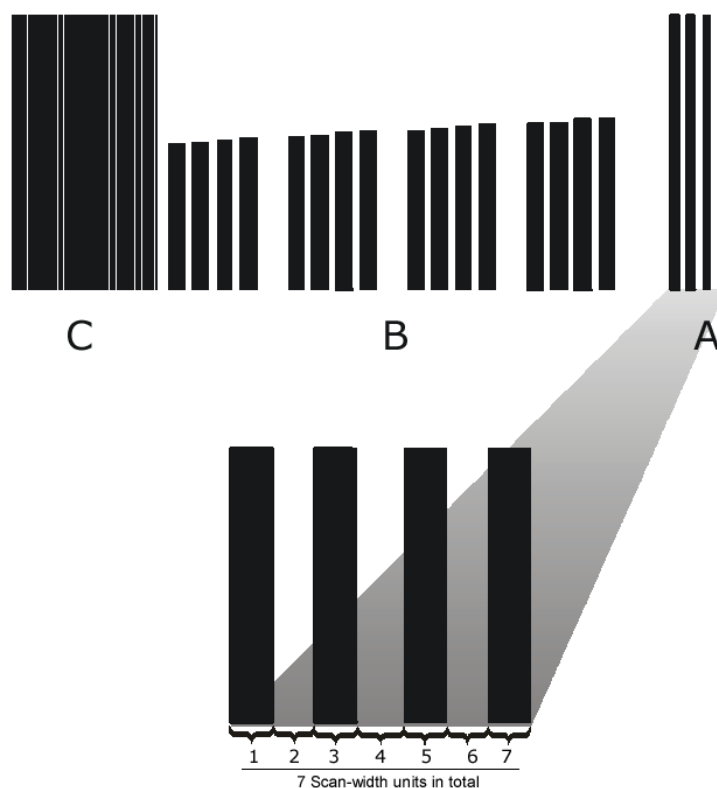
Scan-Width Units

When adjusting the Scan-Width, you adjust up against some line on an **Optical Adjustment Pattern**.
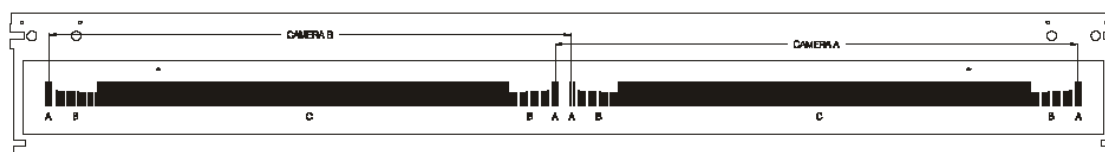
The Optical Adjustment Pattern is a metal construction with a pattern glued on one side. This pattern contains three sub-patterns: A, B and C.
- Sub-pattern A contains a pattern used for Scan-Width adjustment.
- Sub-pattern B contains a pattern used for Vertical Position adjustment.

■ Sub-pattern C contains a pattern used for coarse Focus adjustment.

C   B   A

1 2 3 4 5 6 7
7 Scan-width units in total

The **A** part of the pattern consists of scan-width units (SWU).

Each of the black lines represents a scan-width unit (SWU) as does the white space in between the lines. This makes a total of seven SWU's.

The black lines and whites spaces work like a marker or indicator that tells you how wide the camera scan-width is.

The scan-width units help you adjust the cameras, so that they have the correct scan-width. This ensures that the scanner has the correct optical resolution. Thereby ensuring that the scaling factor of the scanner is correct.

Camera A has three **A** patterns in its view:

A   A   B   C   B   A
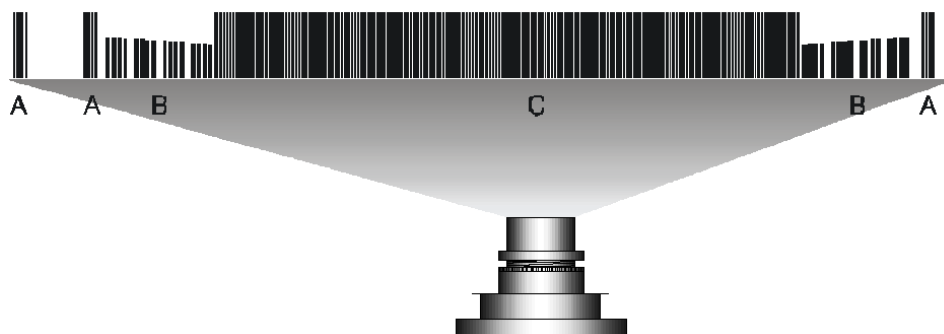
To ensure that the camera has the correct optical resolution, you are going to adjust the camera, so that it covers six scan-width units. This means that the camera has to see a total of six units at the ends of the view field. This can be two on the left and four on the right or five on the left or one on the right. The unit arrangement is not important as long as there are six in total.

Later on you will center the camera, so that there will be three units at each end.

Scan-Width Adjustment

The purpose of Scan-Width adjustment is to position the camera so the field of vision is correct.

1   Remove the guide plate and place the Optical Pattern on the scanner. Align the pattern by pressing it to the right towards the operator panel and backwards toward the back of the scanner.

2   If not selected, select button 9 in SCANtest 6. Select **Uncorrected** Light Profile and press **Execute** (make sure that the Green Channel is selected).
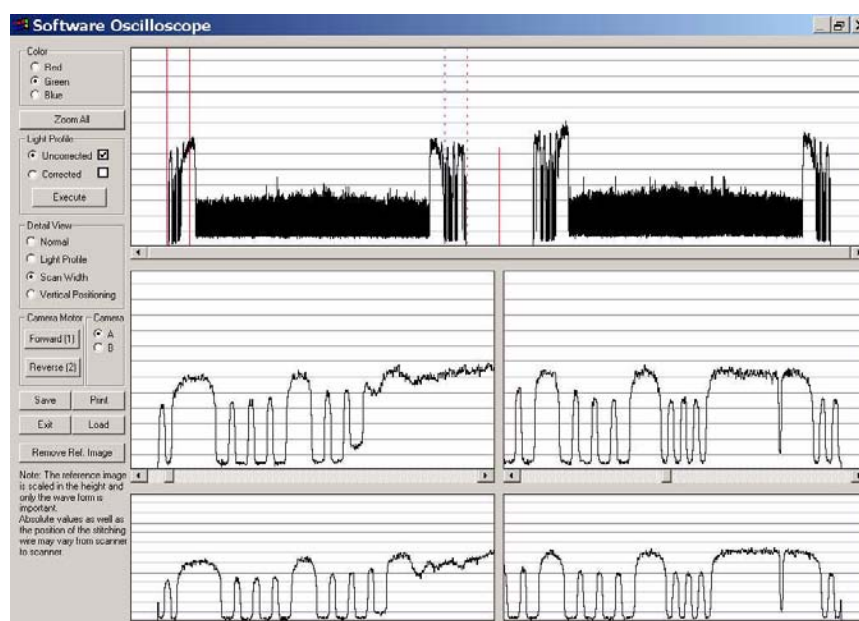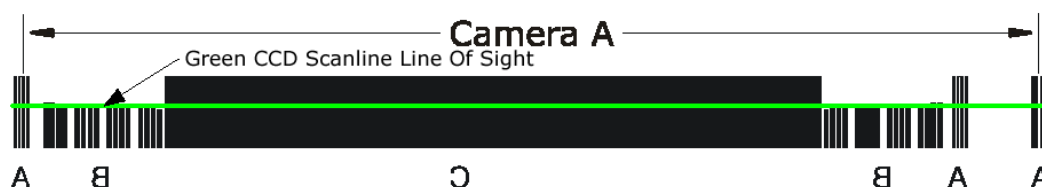

3   This is what **Camera A** is going to see, when the scan-width adjustment is finished:


Camera A scans from right to left, so the image above is a mirrored section of the total **Scan-Width pattern** as the copier actually sees it. The camera only sees a single line of pixels with the green CCD pixel line that

we enabled under step 2. The goal is to adjust the camera so that the green pixel line of the CCD is positioned as the green line below:

When you have succeeded in getting this, most of the adjustments for **Camera A** are finished.

But first we start by setting the Scan-Width of Camera A. You use the software oscilloscope to guide you, and this is what you are going to see:
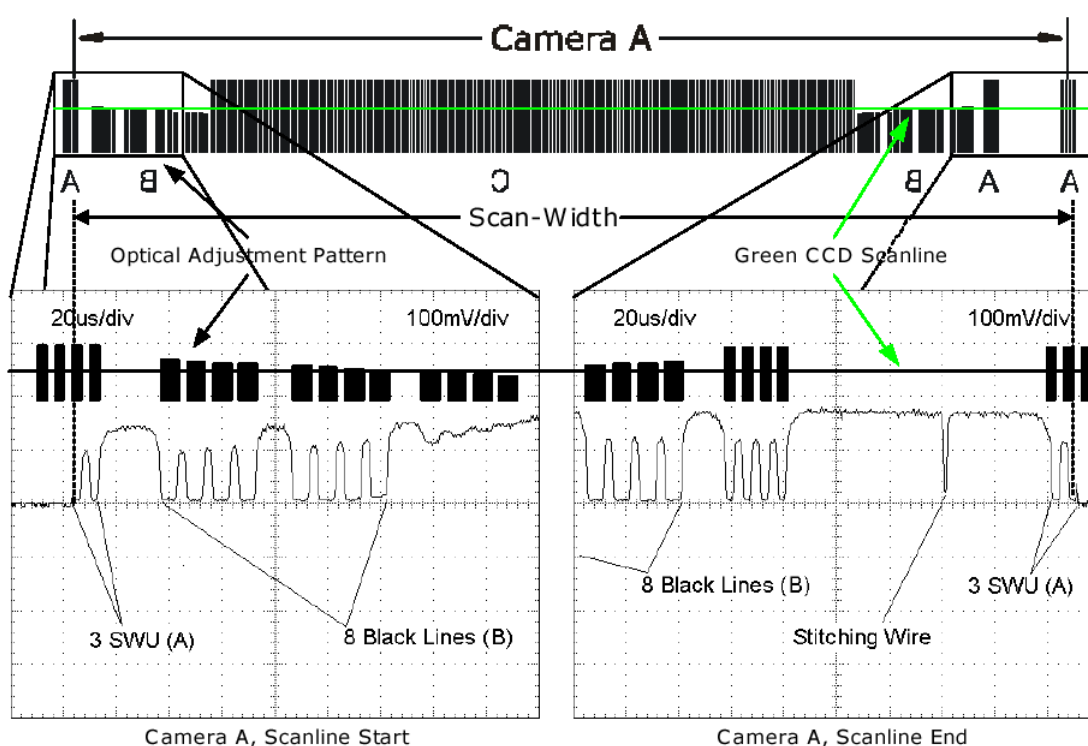
In the image you see a real oscilloscope image of the left- and the right most part of the **Camera A Scan-Width pattern**. Whenever the camera sees a black line, the output level goes down. It goes up when seeing white. When the **Green CCD Scanline** is in the correct position, each end of the camera output will have the appearance as shown.

4   Now press **Scan Width** under Detail View on the software and the program automatically zooms in on the left and right part (Scanline Start/

End) of the output. On the left side you will get an output like one of these (or something in between):
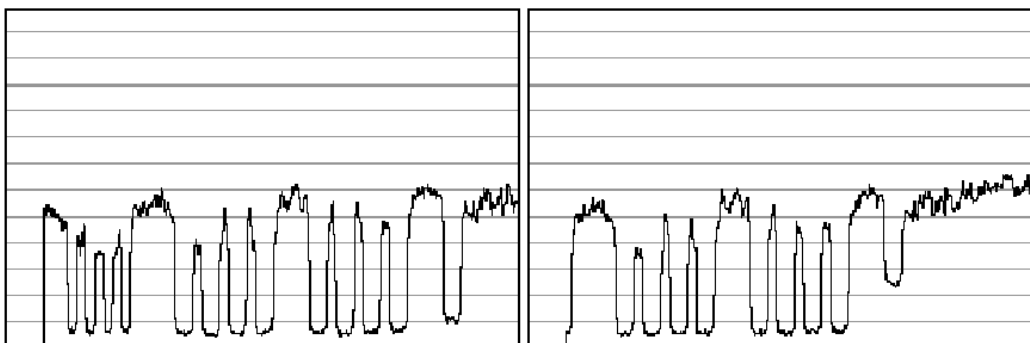
The output we are aiming for can be seen below, therefore:

■ The left output is too much to the left – if you have an output like this, you need to slide the CCD board to the right by turning the **CCD Centering** tab upwards.

■ The right output is too much to the right – if you have an output like this, you need to slide the CCD board to the left by turning the **CCD Centering** tab downwards.

5 When you have one, two or three scan-width units (SWU) on the left side of the camera, look at the right side of the camera.

6 On the right side (Scanline End) you will get output like one of the following:
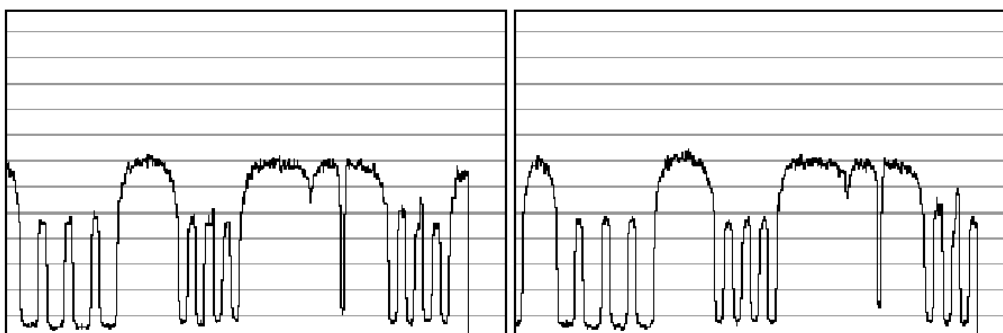
Remember how many scan-width units you had on the left side and remember that there has to be six in total.

If you had three SWU's on the left side of the output you also have to have three on the right and the output we are aiming at is as shown below. Therefore:

■ On the left picture above the Scan-Width is too wide – if you have an output like this, you need to move the camera forward to decrease the Scan-Width.

■ On the right picture above the Scan-Width is too narrow - if you have an output like this, you need to move the camera backward to increase the Scan-Width.

Look for the **Stitching Wire.** There's only one of these on the right side of

the camera. If you don't see the Stitching Wire, then the camera has to be pulled back quite a lot because the scan-width is too narrow.

7   Repeat steps 4 to 6 until the camera sees a total of six SWU's.

8   When you have six SWU's in total, use the **CCD-Centering** lever to adjust the camera so that there is three SWU's on each side of the camera as shown below:
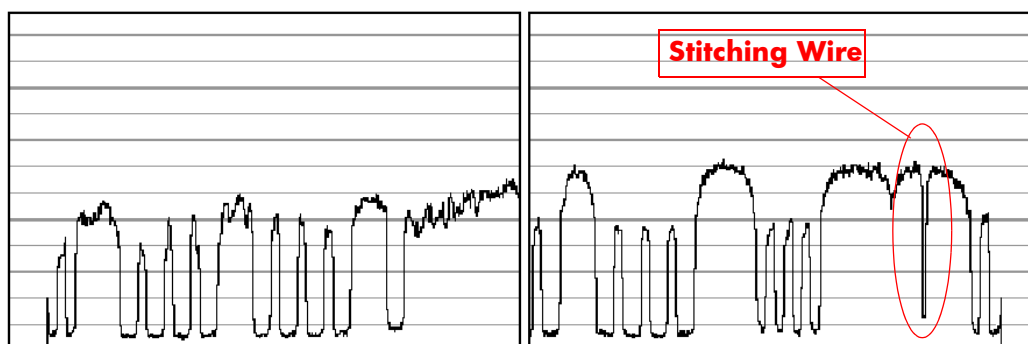
9   Check the focus again because large changes to the Scan-Width adjustment also affects the focus.

10   If the focus needed adjusting, start over with the Scan-Width from step 4, because a slight change in the focus will affect the Scan-width considerably.

11   When you are finished, and both the focus and the Scan-Width are correct, tighten the three **Camera Fixing Screws** without moving the camera.

12   Proceed to the Vertical Positioning section without altering anything about your set-up.
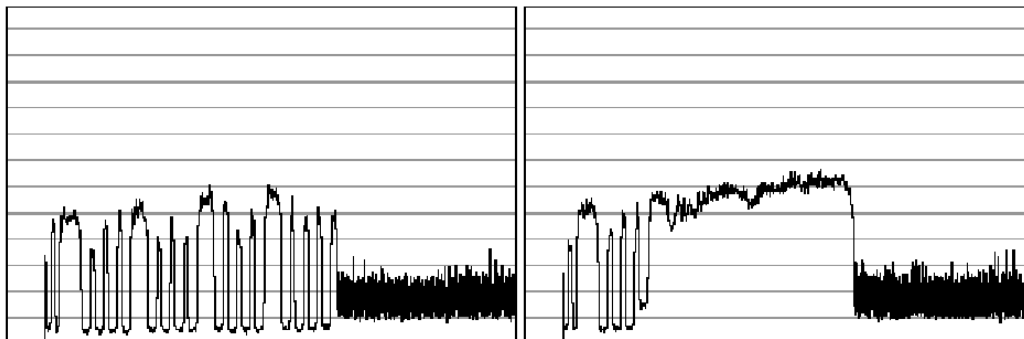
Vertical Positioning

The purpose of the vertical positioning is to adjust the camera, so the **Green CCD Scanline** looks at the correct vertical position on the **Optical Adjustment Pattern** as seen on the picture below. Furthermore it ensures that the Scanline is horizontal.
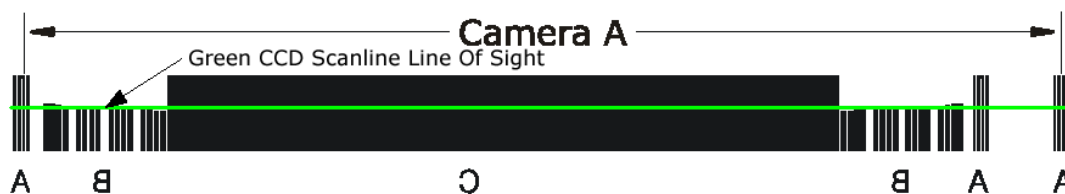

1   SCANtest 6 should still show **Uncorrected Light Profile**, **Green**. If not, change it to those settings.

2   Loosen the **Camera Back-Plate Fixing Screws** if they are not already loose.

3 Select **Vertical Positioning** under Detail View and look at the left part (Scanline Start) of the camera output. You will get an image similar to one of these (or even less lines than shown on the right image):
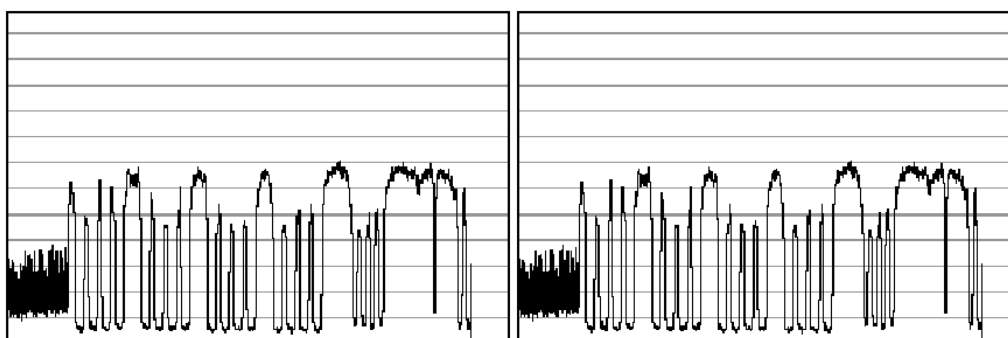

The output we are aiming for can be seen below, therefore:

- On the left image the vertical position is too low – if you have an output like this, you need to lower the left side of camera with the left **Vertical Tilt** lever, by turning to the left.
- On the right image the vertical position is too high - if you have an output like this, you need to raise the left side of camera with the left **Vertical Tilt** lever, by turning it to the right.
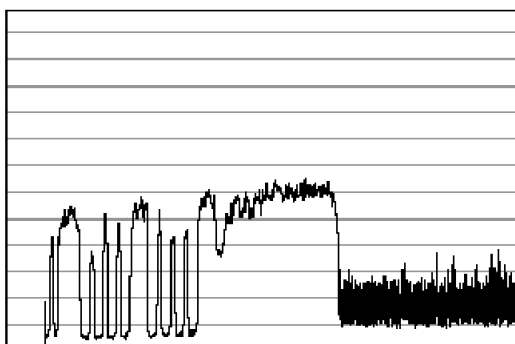
4 When you have adjusted the Vertical Tilt so that the output displays 8 black lines (your output does not have to be identical to the above picture or the Reference Image, just close) on the left side of the camera, look at the right side of the camera.

5 On the right side (Scanline End) you will get an output similar to one of these:

The **Vertical Tilt** lever can't be moved very far before it loses its grip. If this happens while you are adjusting the camera, move the **Vertical Tilt** levers back to the middle position and use the **Vertical Position Pre-Set Screw** to make a coarse adjustment. Then fine tune again with the **Vertical Tilt** lever.

When adjusting the Vertical Position, you continuously have to readjust the CCD Centering (3 scan-width units) with the **CCD Centering** lever, because the **Vertical Tilt** lever moves the camera a little in the horizontal direction.

The output we are aiming for can be seen below, therefore:

- On the left image the vertical position is too low – if you have an output like this, you need lower the right side of camera with the right **Vertical Tilt** lever, by turning downwards.
- On the right image the vertical position is too high - if you have an output like this, you need raise the right side of camera with the right **Vertical Tilt** lever, by turning it upwards.
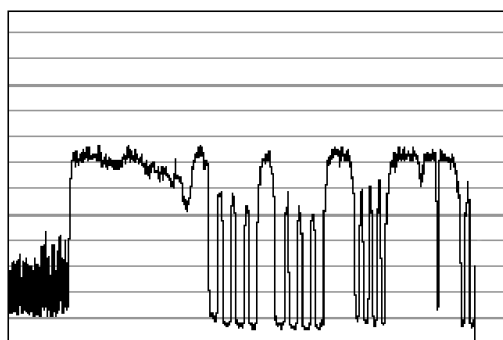
When you have adjusted the Vertical Tilt so that the output displays 8 black lines and 4 smaller lines (it doesn't have to be precise, just close to the above picture) on the right side of the camera, look at the left side again to check that it's still okay (it's probably not). It very likely that you have to go back and forth between left and right a couple of times until both sides are adjusted the right way. That is because adjusting one side affects the other side a little.

6   Check that the CCD Centering is OK. That is that you still have 3 SWU's on each side of the Camera. If you don't then adjust it with the **CCD Centering Lever**.

7   Tighten the **Camera Back-Plate Fixing Screws** gently to prevent the camera from moving out of adjustment.

8   Once the cameras are adjusted, you will need to adjust the whole scanner to fine-tune it by performing the Scanner Maintenance (refer to Page *5-14*).

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