



HP
DesignJet
230/250C
Diagnostics.

VERY IMPORTANT!!!

- **To begin with the tests you have to press 'SetUp', 'Read Settings' and 'Replot' keys while powering the plotter.**
 - **Press the CONNECT button on the Main Window to configure the communication, before perform a test.**
-

Which Test to Perform.

Use the following table as a rough guide to which diagnostic test which assemblies:

Assembly/Feature	Tested by ...
Bail system.	Bail Test, Bench run.
Carriage.	Sensor Test, Pen/Nozzle Test.
Carriage motor and drive system (including belt, pulley and slider rod).	Carriage Axis Test, Bail Test, Bench run.
Cartridge identification.	Pen/Nozzle Test.
Cartridge nozzles.	Pen/Nozzles Test, Print Quality Plot, Pen to Pen Alignment.
Cover Sensor.	Sensor Test.
DRAM SIMM.	Bench run.
EEROM.	Memory Test, Bench run.
Electronics.	Sensor Test, Bail Test, Front-Panel Test, Media-axis Test, Carriage-axis Test, Bench run.
Encoder strip.	Carriage-axis Test, Bench run.

Front-Panel leys and LEDs.
Front-Panel Test.

Media-axis encoder and cable.
Media-axis Test, Bench run.

Media motor and drive system (including drive roller and overdrive).
Media-axis Test.

Media Sensor.
Sensor Test.

Optical Sensor (on carriage).
Sensor Test.

ROM.
Memory Test, Bench run.

Service station.
Bail Test.

Trailing Cable.
Bench run.

When to calibrate the Plotter.

Indications or Repairs Performed.
Calibration Required.

Black Cartridge reseated or replaced.
Bidirectional Alignment (Black Cartridge Alignment).

Drive Roller removed or replaced.
Accuracy Calibration.

Media (X-axis) Motor replaced.
Accuracy Calibration.

The length of plotted lines is not within the accuracy specifications
Accuracy Calibration.

EEROM cleared or replaced the electronic module or carriage.
1. Bidirectional Alignment (Black Cartridge Alignment).
2. Pen to Pen Alignment (Color Cartidge Alignment).
3. Accuracy Calibration.

Jagged vertical black of gray lines.
Bidirectional Alignment (Black Cartridge Alignment)..

Jagged color lines.
Pen to Pen Alignment (Color Cartidge Alignment).

Shadows appear beside colors.
Pen to Pen Alignment (Color Cartidge Alignment).

Test Mode Diagnostics.

Note:

Most of the procedures describe how to disassemble the plotter. Unless otherwise specified, reassemble the parts in the reverse order of disassemble.

Connect.

Front Panel.

Memory.
Pen Height.
Clean Roller.
Media-axis.
BenchRun(Write).

Pen/Nozzle.
Sensor.
Carriage-axis.
Bail Test.
BenchRun(Read).

Calibrations and Alignment.

Bidirectional Alignment. Pen to Pen Alignment.
Accuracy Calibration. Print Quality Plot.
Service Plot SetUp Sheet.

Accuracy Calibration



The accuracy calibration procedure is used to correct the end-point accuracy of the media axis. The cartridge axis does not require calibration and is used to calibrate the media axis.

The accuracy calibration also includes calibration of the optical sensor on the carriage.

Perform the accuracy calibration whenever the:

- EEROM is erased.
- Electronic module is replaced.
- Drive roller is removed or replaced.
- Media (X-axis) motor is replaced.
- Cartridge carriage is replaced.

Before Performing the Accuracy Calibration.

Under normal environmental conditions and on HP Inkjet Polyester D/A1-size media, plot a drawing that contains two "X" marks nominally positioned 500mm (19.69 in.) apart.

Measure the distance between the centers of the "X" marks on the plot. Accuracy calibration is needed if this distance is not 500mm (19.69in) \pm 1mm (0.04in). If the measured accuracy, media thickness, or environmental conditions vary greatly from the factory standards, recalibrate the plotter by continuing with the following procedure

Performing the Accuracy Calibration.

1 - Place a sheet of HP inkjet polyester film over the top of the plotter for 10 minutes to let the sheet stabilize to the environmental conditions. Use a sheet of approximate size A1/D. *YOU MUST USE POYESTER FILM*. Otherwise the optical sensor on the carriage will be calibrated incorrectly, and the plotter will have problems loading some types of media.

2- Load the film, with the matte (dull) side down, in portrait orientation into the plotter

3 - When the 'Ready' LED lights up, press the WRITE button . The 'Ready' LED begins to flash and the plotter plots a calibration plot. Wait until the plotter ejects the sheet, and the 'Load Media' LED lights up.

4 - Unload the sheet.

5 - Cut the blank end off the film by cutting along the long dashed line on the plot; the cut must be very straight.

6 - Reload the sheet facedown into the plotter, in the direction indicated by the arrows on the calibration plot.

7 - When the 'Ready' LED lights up, press the READ button . The 'Ready' LED begins to flash. The plotter takes less than 1 minute to read the calibration sheet, to calculate the calibration data and to save the data in the EEROM. Wait until the plotter ejects the sheet, and the 'Load Media' LED lights up.

8 - Unload the sheet.

Normal Environmental Conditions

Users should use the plotter in an environment between 20% and 80% relative humidity and in a range of 15-30 degrees Celsius (59-86 degrees Fahrenheit).

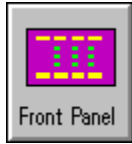
End-Point Accuracy.

Specifies how accurately a plotter can draw a given length of line.

The end-point accuracy specification for the plotters is +/-0.38mm (0.015in) or +/-0.2% of the specified vector length, whichever is greater, at normal environmental conditions on HP special polyester film. Use the following formula to calculate the plotter's accuracy:

$$((\text{Measured length} - \text{Desired length}) / \text{Desired length}) \times 100 = \% \text{Error}$$

Front Panel



The Front Panel Test is used to check the operation of the front panel keys.

Performing the Front Panel Test.

- 1- Press the START button to begin the test (All the LEDs turn off).
- 2- Press each front panel key **on the plotter**.
The corresponding key should **change color on the screen**.
Note:
*You have only 15 seconds to press each key.
If a key fails, it does not change color, and a timeout occurs.*
- 3 - When ALL keys have changed color, ALL the front panel LEDs light up.
- 5 - Press the EXIT button to return to the main window.

Replacing Front Panel Assembly.

- 1- Remove the top cover
- 2- Remove the right end cover and the front panel.
- 3- Disconnect the Front Panel Assembly.
- 4- Reinstall the front panel assembly.
- 5- Reinstall the right end-cover.

Bail Test



This tests the operation of the bail system, service station and carriage drive.

Performing the Bail Test.

- 1- Press the START button to begin the test.
- 2- Now the following routine begins:
 - The carriage moves out of the service station and back in, to position itself over the engaging lever. This causes the bail-lift mechanism gear and the left drive-roller to engage.
 - The top of the roller rotates towards you. This causes the bail to be gently raised and then lowered.
 - Again the carriage moves out of, and back into, the service station. However, this time it parks beyond the engaging lever.
 - The top of the roller rotates slightly forward and then back.
- 3- This routine is done twice.
- 4- You have to check if the bail works correctly.
- 5- Press the EXIT button to return to the main window.

Removing the bail.

- 1- Remove the bail

Removing the Bail-Lift Mechanism.

- 1- Remove the bail
- 2- Remove the left end-cover.
- 3- Remove the primer.
- 4- Remove the service station.
- 5- Remove the bail-lift mechanism.

Carriage Axis Test



This tests the operation of the carriage motor, belt, tensioner and encoder strip.

WARNING

This test waste a lot of time receiving data, and seems the plotter is not working. Please, do not turn off the plotter and the test, wait 3 to 5 minutes until the test shows the results.

Performing the Carriage Axis Test.

1 - Ensure that the carriage is parked in the service station, and press the **correct** START button to begin the test. (The test does not include carriage-axis initialization. If carriage starts somewhere in the center of the plotter, or you choose the incorrect START button, it will hit the right-hand side of the plotter when the test begins, and the test will fail.)

2 - Now the following routine begins:

- Forward movement: The carriage moves towards the right-hand side of the plotter and returns to the service station. Then the plotter sends all the collected data via serial port to the computer. All this data is stored in a file (dj250c.fwd) and after some calculations is displayed on graphs.
- Backward movement: The carriage moves towards the right-hand side of the plotter and returns to the service station. Then the plotter sends all the collected data via serial port to the computer. All this data is stored in a file (dj250c.bwd) and after some calculations is displayed on graphs.

4 - Press the EXIT button to return to the main window.

Note:

The files containing the graphs are overwritten each time you perform the test. So, change their names if you want to save them permanently.

You can use other applications to look at them (for example: Windows Notepad).

ips = inches per second.

PWM = pulse-width modulation.

Removing the Carriage Motor.

- 1- Remove the top cover
- 2- Remove the right end cover and the front panel.
- 3- Remove the left end-cover.
- 4- Remove the Encoder Strip.
- 5- Remove the Right Bracket.
- 6- Remove the Carriage Motor.
- 7- Reinstall the Carriage Motor.

- 8- Reinstall the Encoder Strip.
- 9- Reinstall the right end-cover.

Media Axis Test



This tests the operation of the media-axis motor, encoder and gears.

Performing the Media Axis Test.

1 - Press the START button to begin the test.

2 - Now the following routine begins:

- The carriage moves out of the service station and back in, to position itself over the engaging lever. This causes the bail-lift mechanism gear and the left drive-roller gear to engage.
- The top of the roller rotates towards you. This causes the bail to be gently raised and then lowered.
- Again the carriage moves out of, and back into, the service station. However, this time it parks beyond the engaging lever.
- The top of the roller rotates slightly forward and then back.
- The top of the drive roller rotates slightly towards you.

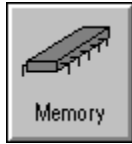
3 - The test returns the PWM detected. A typical media-axis PWM is 52. **The maximum allowed is 65.**

4 - Press the EXIT button to return to the main window.

Removing the Media Motor.

- 1- Remove the top cover.
- 2- Remove the right end cover and the front panel.
- 3- Remove the Spitton.
- 4- Remove the Media Motor and Drive Roller Gear.
- 5- Reinstall the right end-cover.

Memory Test



This tests the operation of the EEROM and ROM installed on the plotter.

Performing the Memory Test.

- 1 - Press the START button to begin with the test.
- 2- The diagnostics verify the CRC's of non volatile RAM (EEROM).
- 3- Calculate the checksum of boot ROM and on-board mask ROM, and verify it with the expected one.
- 4 -The diagnosis returns the type of rom SIMM, if any. (TBD)
- 5 - Press the EXIT button to return to the main window.

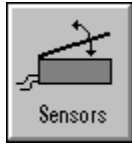
Removing the Electronics Module.

Note:

The electronics module is one field-replaceable part. You do not need to open it. If it is faulty, exchange it for a new one.

- 1- Remove the top cover.
- 2- Remove the right end cover and the front panel.
- 3- Disconnect the Front Panel Assembly.
- 4- Remove any DRAM or ROM SIMMs from the module.
- 5- Remove and Reassemble the Electronics Module.
- 6- Install DRAM or ROM SIMMs from the old module.
- 7- Reinstall the front panel assembly.
- 8- Reinstall the right end-cover.

Sensors Test



This tests the operation of the cover sensor, media sensor and optical sensor.

Performing the Sensors Test.

- 1 - Press the START button to begin the test.
- 2 - Media Sensor Test.
Introduce the media until the sensor clicks. Then quickly pull the media back out. Do this 3 times.
If you actually load the media, a timeout occurs.
If the sensor does not work properly, you get three timeouts.
- 3 - Cover Sensor Test.
Raise and lower the cover three times.
If the sensor does not work properly you get three timeouts.
- 4 - The optical sensor locates the edges of the media five times. The measurements are in encoder-strip units (slots). The origin is the right-hand end of the encoder strip.
- 5 - Press the EXIT button to return to the main window.

Removing and replacing the Media Sensor.

- 1 - Remove the top cover.
- 2 - Remove the right end cover and the front panel.
- 3 - Disconnect the Front Panel Assembly.
- 4 - Remove any DRAM or ROM SIMMs from the module.
- 5 - Remove the Electronics Module.
- 6 - Remove the Media-Sensor Assembly.
- 7 - Replace the Media-Sensor Assembly.
- 8 - Install DRAM or ROM SIMMs from the old module.
- 9 - Reinstall the Front Panel Assembly.
- 10- Reinstall the right end-cover.

Removing the Top-Cover Sensor.

- 1- Remove the top cover.
- 2- Remove the right end cover and the front panel.
- 3- Disconnect the Front Panel Assembly.
- 4- Remove the Top-Cover Sensor.
- 5- Reinstall the front panel assembly.
- 6- Reinstall the right end-cover.

Removing and replacing the Carriage.

- 1 - Remove the top cover
- 2 - Remove the right end cover and the front panel.
- 3 - Remove the left end-cover.

- 4 - Remove the Encoder Strip.
- 5 - Remove the Right Bracket.
- 6 - Remove and Reassemble the Cartridge Carriage.
- 8 - Reinstall the Encoder Strip.
- 9 - Reinstall the Front Panel Assembly.
- 10- Reinstall the right end-cover.

Bench Run Test (Write)



The bench run is a routine that each plotter performs before it leaves the manufacturing site. The bench run tests the operation of the electronics, carriage-axis system, media-axis system, bail-lift mechanism, and service station.

Performing the Bench Run (Write) Test.

1 - First of all you have to define the bench run cycles you want the plotter to do.

We define:

Target Y Cycles: BR Y Axis Cycles.

Target X cycles: BR X Axis Cycles.

Target Bail Cycles: BR Bail/Stepper Cycles.

Swaths per BR Cycle: BR Swath Cycles per BR Cycle.

Bail cycles per BR Cycle: BR Bail/Service Station Cycles per BR Cycle.

2 - Once the cycles are defined, press START button, and these values will be loaded into the EEROM.

(A long cycle time is presumed, so **the diagnostics program is closed.**)

3 - Turn off the plotter and enter Service Mode 1.

4 - Press the Cancel (ALT) and SetUp(Bench Run) keys. Now the plotter begins to perform the Bench Run cycles. The Fast LED flashes when the bench run has finished. To stop the bench run before it finishes, press the Replot Key on the plotter.

Bench Run Test (Read)



This test reads the number of bench run cycles that have been completed before the procedure was stopped.

Performing the Bench Run (Read) Test.

1- Press the START button to begin the test.

2 - You could see two columns informing you of the number of bench run cycles completed and bench run cycles previously defined.

We check:

Target Y Cycles: BR Y Axis Cycles.

Target X cycles: BR X Axis Cycles.

Target Bail Cycles: BR Bail/Stepper Cycles.

3 - Press the EXIT button to return to the main window.

Clean Roller



Due to the ink's reflectance, ink spilled on the roller can disrupt the plotter's edge-sensing function. To remove any ink from the roller, perform the following procedure.

Performing the Clean Roller Test.

- 1- Press the START button to rotate the roller.
- 2- When the stained area of the driver roller is positioned at the top where it can be cleaned press the STOP button.

WARNING

In the following steps, DO NOT allow water to run on to electrical components or circuits, or through openings in the enclosure, as this can create a shock hazard leading to death or injury.

- 3- Apply IPA (isopropyl alcohol) to a soft, lint-free rag.
- 4- Use the rag to clean the roller surface.
- 5- If other areas of the roller have been stained by ink, repeat the above steps.
- 6- Allow the drive roller to dry.
- 7- Press the EXIT button to return to the main window.

Connect



When you start the diagnostics program, it does not open the serial port. This is to allow you to see the complete diagnostics environment without a plotter connected. So, to begin any test, first of all you have to connect to the plotter.

Connecting.

- 1- Press CONNECT button to begin.
- 2- Make sure you are using the proper serial cable (24542G or similar).
- 3- Configure the link to match the unit set-up. (Check the SetUp Sheet)

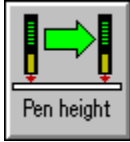
Note:

The factory default Baud Rate (9600) is the one recommended.

Parity has to be forced to NONE.

- 4- Press the START button, and check the message box informing you of the status of the communication.

Carriage Height



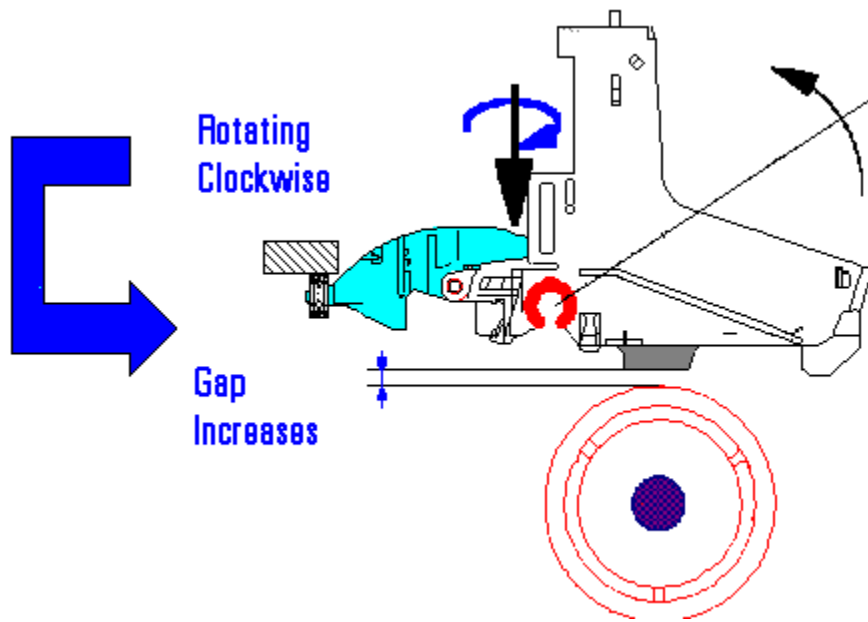
Pen to paper spacing (P2PS) is one of the most critical parameters of the plotter. Deviations of P2PS from the specifications could cause severe Print Quality defects, such as: Ink smearing, spray or Bidirectional errors. In order to fix or minimize, the HP DesignJet 230/250c plotters have an adjustable pen carriage, which is adjusted by means of a screw and a hinge mechanism.

ATTENTION

For this test, you need a special optical tool in the shape of a cartridge (Part Number: xxxxxxxx). The tool contains 10 LEDs to indicate the cartridge-to-media spacing in millimeters.

Performing the Pen Height Test.

- 1- Load D/A1 or E/A0 (depending on the model) HP Special Paper.
- 2- Open the cover, and keep the cover switch pressed, while cover is open.
- 3- Load the Pen Height Tool in the black stall.
- 4- Press the START button.
- 5- Check the LED bar to know the Pen to Paper Spacing. (Remember: $1\text{mm} < \text{P2PS} < 1.5\text{mm}$).
- 6- Press the NEXT button to perform the next measurement (There are 5 measurements along the roller)
- 7- If the measurements are out of specs, tighten or loosen the indicated screw on the carriage.



8- Repeat the previous steps, in order to know if the P2PS is now correct.

Print Quality Plot



The Print Quality plot is used to troubleshoot print quality.

ATTENTION

Use a 10X magnifier to help identify print-quality problems.

Performing the Print Quality Plot.

- 1- Load Polyester Paper (min. size: A/A4. The plot is printed more than once on larger sizes.)
- 2- Press the START button to begin.
- 3- The PQPlot is plotted.

ATTENTION

Wait until the plot is complete and the plotter indicates 'Ready' before you begin another diagnostic.

- 3- Press the EXIT button to return to the main window.

How to detect Errors in the Print Quality Plot.

- 1- Area Fill
- 2- Nozzle Checkout
- 3- Vertical Line Straightness (VLS).
- 4- Color Alignments.
- 8- Banding.

Service Configuration Plot



This test plots the Service Configuration plot.

Plotting the Service Configuration Plot.

1- Load A/A4 media.

Note:

Wait until the plotter is 'Ready' before you perform the next step.

2- Press the START button to begin.

Note:

Wait until the plot is complete and the plotter is 'Ready' before you begin another diagnostic.

3-Press the EXIT button to return to the main window.

How to interpret the Service Configuration Plot.

1- How to interpret the Service Configuration Plot .

Pen/Nozzles Test



This tests the operation of the carriage optical sensor and the connection between the carriage flex circuit and the cartridges, it also optionally checks the nozzles of every cartridge.

Performing the Pen/Nozzles Test.

- 1- Press the START button to begin the test.
- 2- The test gets the cartridge identification for all the cartridges and informs you if the cartridges are correctly positioned.
- 3- The test tests the connection between the carriage flex circuit and the cartridges by checking the electrical continuity for all the nozzles.

Note:

In the next step, if you decide to print the Print Quality Plot, Load A/A4 media, and wait until the 'Ready' light is on.

- 4 - Optionally you can perform the Print Quality Plot which enables you to check that all the nozzles are working correctly (Check area fill and nozzle checkout).
- 5 - Press the EXIT button to return to the main window.

Note:

In most cases you can fix these problems changing the cartridges and cleaning the carriage flex circuit however, if the problems continues, Change the Cartridge Carriage.

Removing and replacing the Carriage.

- 1 - Remove the top cover
- 2 - Remove the right end cover and the front panel.
- 3 - Remove the left end-cover.
- 4 - Remove the Encoder Strip.
- 5 - Remove the Right Bracket.
- 6 - Remove and Reassemble the Cartridge Carriage.
- 8 - Reinstall the Encoder Strip.
- 9 - Reinstall the Front Panel Assembly.
- 10- Reinstall the right end-cover.

SetUp Sheet



This test prints/reads the SetUp Sheet.

Plotting the SetUp Sheet.

1- Load a sheet of A/A4 size paper, in portrait orientation.

ATTENTION:

Before performing the next step, be sure the media load process is complete and the plotter is in the 'Ready' status.

2- Print the SetUp Sheet by pressing the WRITE button.

3- Wait until the Load Media light comes on and the plotter ejects the sheet, and remove it.

4- Follow the instructions on the sheet itself.

5- Having marked the appropriate ovals, reload the sheet into the plotter, printed side down and with the large arrow pointing into the plotter. T

ATTENTION:

Before performing the next step, be sure the media load process is complete and the plotter is in the 'Ready' status.

6- Press the READ button to cause the plotter to read the SetUp sheet with your options. The plotter now reads your marks and reconfigures itself automatically.

7- When the Load media light comes on again, remove the sheet and make sure that the plotter has marked your selections with a check mark.

8- Press the EXIT button to return to the main window.

Note:

It's a good idea to store the latest copy of the SetUp Sheet with the Quick Reference Guide in the plastic pocket at the side of the plotter.

Bidirectional Alignment. also called **Black Cartridge Alignment.**



Used to correct the misalignment errors in the black cartridge.

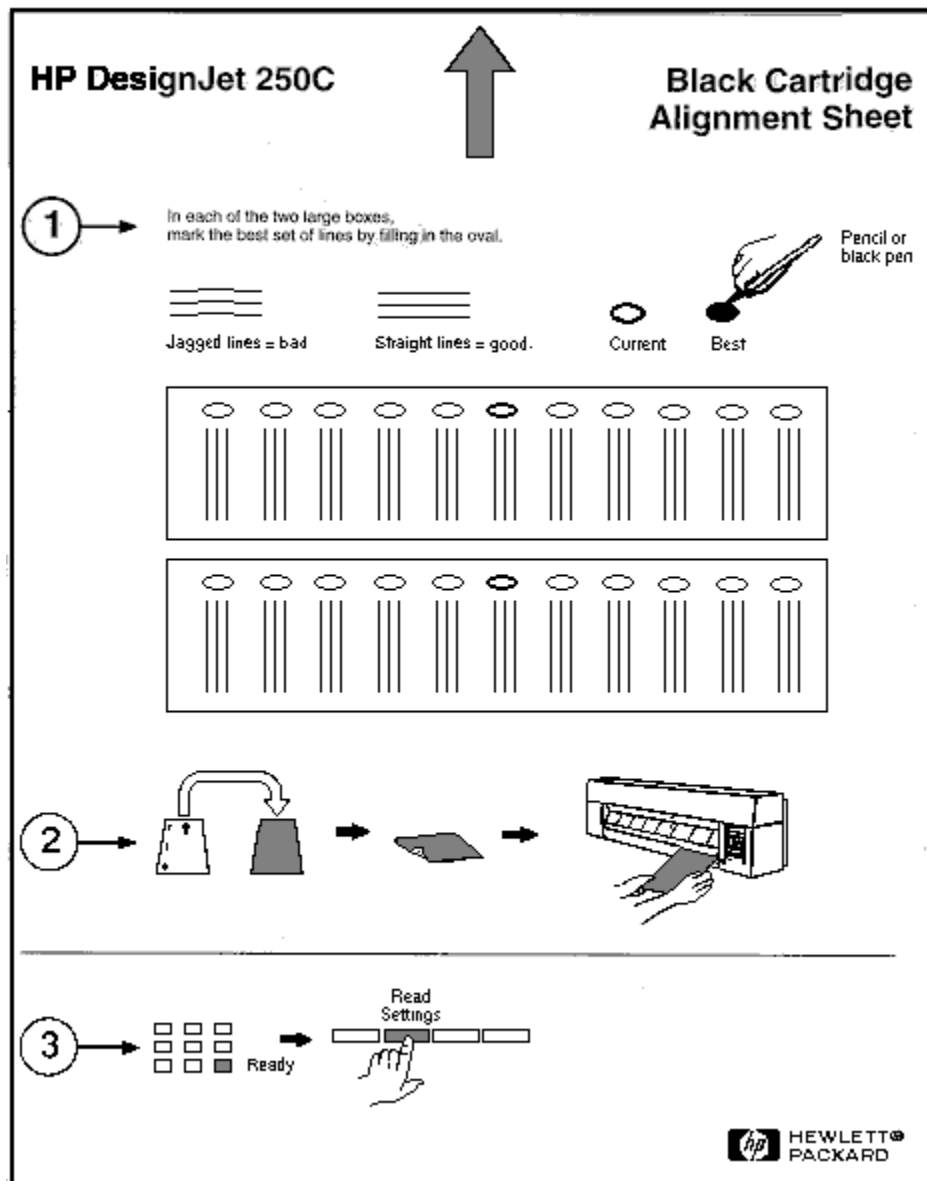
Performing the Bidirectional Alignment.

1- Load a sheet of A/A4 size paper, in portrait orientation.

ATTENTION:

Before performing the next step, be sure the media load process is complete and the plotter is in 'Ready' status.

2- Print the bidirectional Alignment Plot by pressing the WRITE button. An example of it is shown below.



3- Wait until the Load Media light comes on and the plotter ejects the sheet, and remove it.

4- Follow the instructions on the sheet itself. As you will see, this involves you identifying the straightest set of vertical lines in each of the two boxes.

5- Having marked the appropriate ovals (even if they are the same as the current selections), reverse the sheet as indicated, and reload it.

ATTENTION:

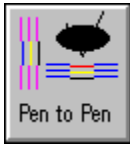
Before performing the next step, be sure the media load process is complete and the plotter is in 'Ready' status.

6- Press the READ button to read the Bidirectional alignment.

7- When the Load media light comes on again, remove the sheet and make sure that the plotter has marked your selections with a check mark.

8- Press the EXIT button to return to the main window.

Pen to Pen Alignment. also called **Color Cartridge Alignment.**



This test achieves two objectives: 1) It tells you which cartridge, if any, is not performing correctly and 2) It enables you to check the alignment of all four cartridges and, if necessary, adjust it.

TWO IMPORTANT POINTS:

- **ALWAYS use the Pen to Pen Alignment Sheet immediately after printing it. That is, DO NOT print any other plotter in between.**
 - **NEVER re-use a Pen to Pen Alignment Sheet. Its settings make sense only when used immediately after printed.**
-

Perform the Pen to Pen Alignment.

1- Load a sheet of A/A4 size **SPECIAL INKJET** paper, in portrait orientation.

ATTENTION:

Before performing the next step, be sure the media load process is complete and the plotter is in 'Ready' status.

2- Make sure that the Media Type on the Front Panel is set to Special Paper.

3- Print the Pen to Pen Alignment Plot by pressing the WRITE button.

4- Wait until the Load Media light comes on and the plotter ejects the sheet, and remove it. The plot is the Color Cartridge Test Sheet. Notice that there are two parts, related to two quite distinct tasks:

- The part headed **To check the nozzles** enables you to see if any of the cartridges is not printing correctly. It is to be used when cleaning the nozzles (priming).
- The part headed **To check the cartridge alignment** enables you to check and, if necessary, adjust the alignment between the cartridges, in response to a print quality problem.

5- Follow the instructions on the sheet itself. If it's necessary, having marked the appropriate ovals, reverse the sheet as indicated in step 3a on the sheet, and reload it.

ATTENTION:

Before performing the next step, be sure the media load process is complete and the plotter is in 'Ready' status.

6- Press the READ button to read the Pen to Pen Alignment Sheet.

7- When the Load media light comes on again, remove the sheet and make sure that the plotter has marked your selections with a check mark.

8- Press the EXIT button to return to the main window.

