The science behind the report:

Improve productivity with the new Dell P-Series displays in a dual-display configuration

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Improve productivity with the new Dell P-Series displays in a dual-display configuration.

On June 22, 2018, we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears. For older systems, we chose configurations representative of typical purchases of those systems. We concluded hands-on testing on July 5, 2018.

The displays we tested

	Dell™ 24 Monitor - P2419H	Dell 24 USB-C Monitor P2419HC	Dell 24 Monitor - P2414H
Resolution	1920x1080	1920x1080	1920x1080
Screen size	23.8 "	23.8 "	23.8
Number of USB 2.0 ports	2	2	4
Number of USB 3.0 ports	2	2	0
USB-C connectivity	No	Yes	No
Video ports	DisplayPort, HDMI, VGA	DisplayPort In, DisplayPort Out, HDMI	DisplayPort, DVI, VGA
Base dimensions (width x depth)	8.12 x 6.54 in. 53.2 sq. in.	8.12 x 6.54 in. 53.2 sq. in.	8.85 x 7.08 in. 62.7 sq. in.

Note: We used the following steps to determine the dimensions of the base:

1. Using a set of zeroed digital calipers, measure the base width three times and take the median measurement.
2. Measure the base depth three times and take the median measurement.

How we tested

Productivity testing

Overview

To see whether worker productivity differed between a dual-display configuration and a single-display configuration, we recruited five test participants to complete a task on both setups, randomly assigning each to start on either the dual- or single-display configuration before switching to the other.

The task involved completing a report worksheet by copying data from source documents and pasting it into the report document. To offset the effects of practice and repetition, we created two versions of the task, A and B. Both versions used the same source documents but the material the user must copy into the report differed.

Setting up the test

We assembled the following set of source documents, which we saved on the hard drive of the systems:

- Excel spreadsheets
    - Grants 2016.xlsx
    - Grants 2017.xlsx
    - Grants 2018.xslx
- PowerPoint presentations
    - Regional Environmental Objectives 2008.ppt
    - Regional Environmental Objectives 2010.ppt
- Word documents
    - Email template.docx
- PDFs
    - Recycling Fact Sheet 2013.pdf
    - Recycling Fact Sheet 2014.pdf
- Images
    - Flow Chart.jpg

We created two sets of test documents for the participants, which we also saved on the system hard drive. Each set included the following:

- a worksheet we designed as a mock report for the participants to complete using information from source documents
- an instructional document to help the participants locate the source material for each section of the worksheet

Before we began testing, we gave the participant an overview of their tasks, and a brief tutorial on how to drag and drop images and shapes. For the single-display configuration, all files were open on the desktop, with the instruction sheet in full-screen view. For the dual-display configuration, we gave the user a brief tutorial on how to use the Dell Display Manager, and the testing began with a preset arrangement of windows using the Easy Arrange feature.

Running the test

Timing started when the participant began entering information into the worksheet and ended when the participant completed the worksheet. The user then moved to the other display configuration and completed the exercise using a new worksheet.

USB-C connectivity testing

Connecting power, video, and peripherals: USB-C versus non-USB-C

USB-C-equipped display

1. Stand at the door to an office with a laptop in hands. Start the timer.
2. Sit down, and connect the USB-C cable to the laptop.
3. Stop the timer.

Non-USB-C-equipped display

1. Stand at the door to to an office with a laptop in hands. Start the timer.
2. Sit down, and connect the power cable to the laptop.
3. Connect the HDMI cable to the laptop.
4. Connect the USB hub cable to the laptop.
5. Connect the first USB storage device to the laptop.
6. Connect the second USB storage device to the laptop.
7. Stop the timer.

Disconnecting power, video, and peripherals: USB-C versus non-USB-C

USB-C-equipped display

1. From the desk, start the timer, and disconnect the USB-C cable from the laptop.
2. Stop the timer.

Non-USB-C-equipped display

1. From the desk, start the timer, and disconnect the power cable from the laptop.
2. Disconnect the HDMI cable from the laptop.
3. Disconnect the USB mouse from the laptop.
4. Disconnect the USB keyboard from the laptop.
5. Disconnect the first USB storage device from the laptop.
6. Disconnect the second USB storage device from the laptop.
7. Stop the timer.

Measuring power usage with SYSmark 2014SE

SYSmark 2014SE installs the following applications, which its test scripts employ:

- Adobe® Acrobat® XI Pro
- Adobe Photoshop® CS6 Extended
- Adobe Premiere® Pro CS6
- Google Chrome™
- Microsoft® Excel® 2013
- Microsoft OneNote® 2013
- Microsoft Outlook® 2013
- Microsoft PowerPoint® 2013
- Microsoft Word 2013
- Trimble SketchUp™ Pro 2013
- WinZip® Pro 17.5

If any of these applications are already on the system under test, they will cause problems with the benchmark due to software conflicts. To avoid any such issues, before we installed the benchmark, we uninstalled all conflicting pre-installed software applications, including different versions of any of the programs SYSmark 2014SE uses.

Setting up the test

1. Purchase and install SYSmark 2014SE with default settings from https://bapco.com/products/sysmark-2014-se/.
2. Install the following two SYSmark 2014SE patches:
    a. SYSmark 2014 SE patch 1 v2.0.1.78
    b. SYSmark 2014 SE patch 1 Hotfix 2 v2.0.1.87
3. Connect an Extech Power Analyzer / Datalogger 380803 via a USB-to-Serial cable to the display under test.

Running the test

1. Launch SYSmark 2014SE by double-clicking the desktop icon.
2. Enter a Project name.
3. Select three Iterations, check the box beside Conditioning Run and beside Process Idle Tasks, and click select Configuration. Use the default SYSmark configuration options, and click Save. Verify that the Energy Consumption test is checked and that the correct COM Port is selected.
4. Click Run Benchmark.
5. When the benchmark completes and the main SYSmark 2014SE menu appears, click Save FDR to save the results.

Read the report at http://facts.pt/lg4li4 ▶

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