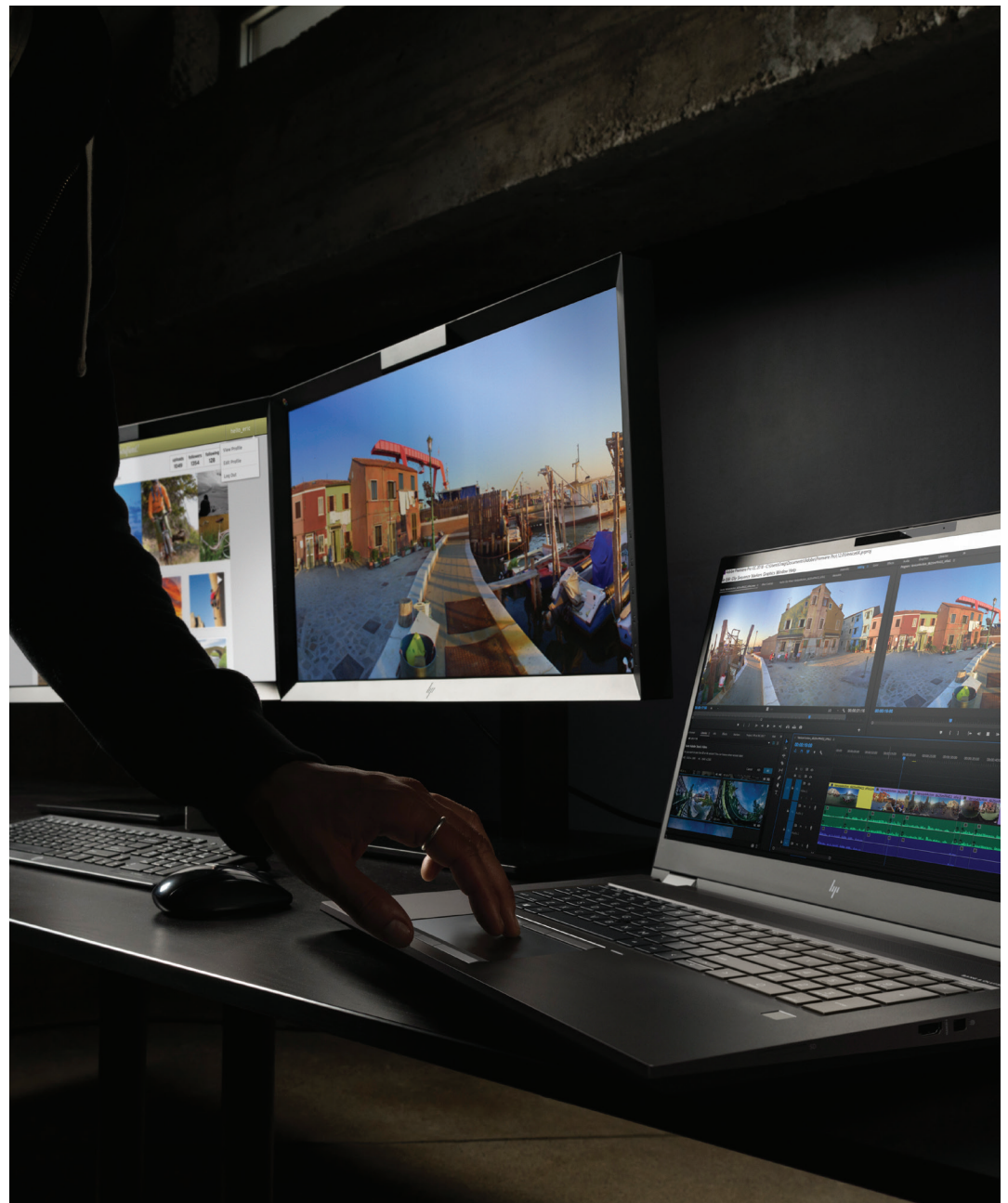




Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |



Configuring Multiple Displays on HP ZBook G7, G8, G9, G10 and G11



Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Introduction

HP ZBooks support multiple independent displays as standalone systems and when docked. This paper provides detailed configuration information. When connecting multiple displays, HP recommends the use of a docking station.

Systems covered in this document include the HP ZBook G7, G8, G9 and G10 laptops. Docks include the HP Thunderbolt G4 Dock (120W and 280W), the HP USB-C® Dock G5 (120W), and the HP Thunderbolt Dock G4 (280W) USB-C®/A Universal Dock G2 (120W).

How to use this document

When connecting multiple displays to HP ZBooks, note the display resolution, host DisplayPort™ version, and available ports. To configure multiple displays on HP ZBooks using this document:

1. Note the resolution(s) of the displays you wish to connect.
2. See Table 1 to determine how many displays your system can host and if you need a docking station.
For connecting multiple displays without a dock, refer to the hosts QuickSpecs.
3. See Table 2 to determine if your system has DisplayPort™ 1.2, 1.3, or 1.4.
4. Use Table 3 for docking station compatibility and support for HP ZBooks.
5. Determine if your system is using 4 lane DisplayPort™ (aka DisplayPort™x4 or high resolution mode in HP F10 setup) or 2 lane DisplayPort™ (aka DisplayPort™x2 or default).
6. For the HP Thunderbolt G4 Dock, use Tables 3-7 to determine if your desired configuration is possible, and which ports to use.
7. For the HP USB-C® Dock, use Tables 8-11 to determine if your desired configuration is possible, and which ports to use.
8. Note configuration details, exceptions, and clarifications in the configuration notes sections.
9. An X in a table cell indicates that the configuration is supported. Numbers in parenthesis () are quantities.

Host system considerations

When configuring multiple displays on HP ZBooks using HP Docking Stations, host specifications will determine the maximum resolution of the attached displays.

Table 1 indicates the maximum number of displays supported on HP ZBooks with and without a docking station (not including DisplayPort™ daisy chain), and which graphics operating modes apply.

Graphics Operating Modes

- **Integrated (iGPU).** Graphics that are integrated with the processor. Also called Unified Memory Architecture (UMA) since it uses system memory instead of dedicated video memory. In HP ZBooks, it is primarily Intel® Integrated graphics.
- **Discrete (dGPU).** A separate graphics subsystem in a computer, such as a Mobile PCI Express Module (MXM) graphics, with dedicated video memory. In HP ZBooks, they are typically NVIDIA® Quadro® GPUs.
- **Hybrid.** The system uses iGPU for most tasks to conserve battery life, and switches to dGPU when higher performance is required. In a hybrid configuration, some displays are driven by iGPU while others are driven by dGPU.



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Table 1: Maximum Displays Supported by HP ZBooks (no DisplayPort™ daisy-chain)

| Host | Number of displays no dock | Number of displays with dock |
|-------------------------------|---|---|
| G11 | | |
| | Up to 4 iGPU | Up to 4 iGPU |
| | Up to 4 Hybrid | Up to 5 Hybrid docked to TBT4 |
| HP ZBook Studio 16 G11 | | 4 from iGPU +1 from NVIDIA® |
| | | Up to 6 Hybrid docked to Multi-Function |
| | | 3 from iGPU + 3 from NVIDIA® |
| HP ZBook Fury 16 G11 | Up to 4 iGPU | Up to 4 iGPU Intel UMA |
| | Up to 5 Hybrid for HE SKU(3500/4000/5000) | Up to 5 Hybrid |
| | Up to 4 Hybrid For MR SKU(1000/2000) | |
| | Up to 4 dGPU for HE SKU(3500/4000/5000/4090)(NVIDIA®) | (4 from dGPU + 1 from iGPU) |
| | Up to 4 dGPU For MR SKU(1000/2000)(NVIDIA®) | |
| | Up to 4 dGPU for HE SKU (3500/4000/5000/4090) (NVIDIA®) | Up to 4 dGPU (NVIDIA®) |
| | Up to 4 dGPU for MR SKU (A1000/2000)(NVIDIA®) | |
| | | NVIDIA Hybrid |
| | | Discrete |
| HP ZBook Power G11 | Up to 4 iGPU | Up to 4 iGPU |
| HP ZBook Power G11 A | Up to 4 iGPU | Up to 4 iGPU |
| HP ZBook Firefly G11 | Up to 4 iGPU | Up to 4 iGPU |
| HP ZBook Firefly G11 A | Up to 4 iGPU | Up to 4 iGPU |



Technical Whitepaper

Contents & navigation

| Host | Number of displays no dock | Number of displays with dock | | |
|-------------------------------|---|---|--------|----------|
| G10 | | | | |
| HP ZBook Studio 16 G10 | Up to 4 iGPU | Up to 4 iGPU | | |
| | Up to 4 Hybrid | Up to 5 Hybrid docked to TBT4 | | |
| | | 4 from iGPU +1 from NVIDIA® | | |
| | | Up to 6 Hybrid docked to Multi-Function | | |
| | | 3 from iGPU + 3 from NVIDIA® | | |
| HP ZBook Fury 16 G10 | Up to 4 iGPU | Up to 4 iGPU | Intel | UMA |
| | Up to 5 Hybrid for HE SKU(3500/4000/5000/4090) | Up to 5 Hybrid | | |
| | Up to 4 Hybrid for MR SKU(A1000/2000) | | NVIDIA | Hybrid |
| | HE: (4 from dGPU +1 from iGPU) MR: (3 from dGPU +1 from iGPU) | (4 from dGPU + 1 from iGPU) | | |
| | Up to 4 dGPU for HE SKU(3500/4000/5000/4090) (NVIDIA®) Up to 4 dGPU For MR SKU(A1000/2000) (NVIDIA®) | Up to 4 dGPU (NVIDIA®) | | Discrete |
| HP ZBook Power G10 | Up to 3 iGPU | Up to 4 iGPU | | |
| HP ZBook Power G10 A | Up to 3 iGPU | Up to 4 iGPU | | |
| HP ZBook Firefly G10 | Up to 4 iGPU | Up to 4 iGPU | | |
| HP ZBook Firefly G10 A | Up to 4 iGPU | Up to 4 iGPU | | |
| G9 | | | | |
| HP ZBook Studio 16 G9 | Up to 4 iGPU | Up to 4 iGPU | | |
| | Up to 4 Hybrid | Up to 5 Hybrid docked to TBT4 | | |
| | | 4 from iGPU +1 from NVIDIA® | | |
| | | Up to 6 Hybrid docked to Multi-Function | | |
| | | 3 from iGPU + 3 from NVIDIA® | | |
| HP ZBook Fury 16 G9 | Up to 4 iGPU | Up to 4 iGPU | Intel | UMA |
| | Up to 5 Hybrid | Up to 6 Hybrid (AMD) | AMD | |
| | (4 from dGPU + 1 from iGPU) | (5 from dGPU + 1 from iGPU) | | Hybrid |
| | | Up to 5 Hybrid (NVIDIA®) (4 from dGPU + 1 from iGPU) | NVIDIA | |
| | Up to 4 dGPU (NVIDIA®) | Up to 4 dGPU (NVIDIA®) | | Discrete |
| | Up to 5 dGPU (AMD) | Up to 5 dGPU (AMD) | | |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

| Host | Number of displays no dock | Number of displays with dock |
|-------------------------------|----------------------------|------------------------------|
| HP ZBook Power G9 | Up to 3 iGPU | Up to 4 iGPU |
| HP ZBook Firefly G9 | Up to 4 iGPU | Up to 4 iGPU |
| G8 | | |
| HP ZBook Studio G8 | Up to 4 iGPU | Up to 4 iGPU |
| | Up to 4 Hybrid | Up to 5 Hybrid |
| HP ZBook Fury 15 G8 | Up to 4 iGPU | Up to 4 iGPU |
| | Up to 5 Hybrid | Up to 5 Hybrid (NVIDIA®) |
| | Up to 4 dGPU (NVIDIA®) | Up to 6 Hybrid (AMD) |
| | Up to 5 dGPU (AMD) | Up to 4 dGPU (NVIDIA®) |
| | | Up to 5 dGPU (AMD) |
| HP ZBook Fury 17 G8 | Up to 4 iGPU | Up to 4 iGPU |
| | Up to 5 Hybrid | Up to 5 Hybrid (NVIDIA®) |
| | Up to 4 dGPU (NVIDIA®) | Up to 6 Hybrid (AMD) |
| | Up to 5 dGPU (AMD) | Up to 4 dGPU (NVIDIA®) |
| | | Up to 5 dGPU (AMD) |
| HP ZBook Power G8 | Up to 3 iGPU | Up to 4 iGPU |
| HP ZBook Firefly 14 G8 | Up to 4 iGPU | Up to 4 iGPU |
| HP ZBook Firefly 15 G8 | Up to 4 iGPU | Up to 4 iGPU |
| HP ZHAN 99 G3 | Up to 2 (1 iGPU, 1 dGPU) | Up to 2 (1 iGPU, 1 dGPU) |

HP ZBook Ports

Displays can be connected to HP ZBooks via USB Type-C® Thunderbolt™ (DisplayPort™ 1.2, 1.3, or 1.4), HDMI, and mini DisplayPort™. Table 2 is a general guideline listing the host system and ports.

Table 2: HP ZBook port summary

| Host System | Thunderbolt™ / USB Type-C® | Additional Ports | #of external displays with resolution |
|----------------------------|---|------------------|---------------------------------------|
| DisplayPort™ 1.4 | | | |
| HP ZBook Studio G8 | (2) USB Type-C® (Thunderbolt™ 4) (DisplayPort™ 1.4) | (1) HDMI 2.0b | |
| HP ZBook Fury 15 G8 | (2) USB Type-C® (Thunderbolt™ 4) (DisplayPort™ 1.4) | (1) HDMI 2.0b | |
| HP ZBook Fury 17 G8 | (2) USB Type-C® (Thunderbolt™ 4) (DisplayPort™ 1.4) | (1) HDMI 2.0b | |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

| Host System | Thunderbolt™ / USB Type-C® | Additional Ports | #of external displays with resolution |
|-------------------------------|---|---|---------------------------------------|
| HP ZBook Power G8 | Thunderbolt™ / USB Type-C®; (2) USB Type-C® (Thunderbolt™ 4) (DisplayPort™ 1.4) | (1) HDMI 2.0b | |
| HP ZBook Firefly 14 G8 | Thunderbolt™ / USB Type-C®; (2) USB Type-C® (Thunderbolt™ 4) (DisplayPort™ 1.4) | (1) HDMI 2.0b | |
| HP ZBook Firefly 15 G8 | Thunderbolt™ / USB Type-C®; (2) USB Type-C® (Thunderbolt™ 4) (DisplayPort™ 1.4) | (1) HDMI 2.0b | |
| HP ZBook Studio 16 G9 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) (1) SuperSpeed USB Type-C® 10 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | | (3) *8K @30 Hz |
| HP ZBook Fury 16 G9 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) Mini DisplayPort™ 1.4 | (4)* 8K @30 Hz |
| HP ZBook Power G9 | (1) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (1)* 8K @30 Hz + (1) 4K @60 Hz |
| HP ZBook Firefly G9 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (2) 8K @30 Hz + (1) 4K @60 Hz |
| HP ZBook Studio 16 G10 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) (1) SuperSpeed USB Type-C® 10 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | | (3) *8K @30 Hz |
| HP ZBook Fury 16 G10 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) Mini DisplayPort™ 1.4 (1) HDMI 2.1 | (4)* 8K @30 Hz |
| HP ZBook Power G10 | (1) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (1)* 8K @30 Hz + (1) 4K @60 Hz |
| HP ZBook Power G10A | (1) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.1 | (2)* 8K @30 Hz |
| HP ZBook Firefly G10 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (2)* 8K @30 Hz + (1) 4K @60 Hz |
| HP ZBook Firefly G10A | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (2)* 8K @30 Hz + (1) 4K @60 Hz |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

| Host System | Thunderbolt™ / USB Type-C® | Additional Ports | #of external displays with resolution |
|-------------------------------|---|---------------------------|---------------------------------------|
| HP ZBook Studio 16 G11 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 2.1) | | (2) *8K @60 Hz |
| | (1) SuperSpeed USB Type-C® 10 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | | (1) *8K @30 Hz |
| HP ZBook Fury 16 G11 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) Mini DisplayPort™ 1.4 | (4)* 8K @30 Hz |
| | | (1) HDMI 2.1 | |
| HP ZBook Power G11 | (1) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (1)* 8K @30 Hz + (1) 4K @60 Hz |
| | | | |
| HP ZBook Power G11 A | (1) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate(USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.1 | (2)* 8K @30 Hz |
| HP ZBook Firefly G11 | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate (USB Power Delivery, DisplayPort™ 1.4) | (1) HDMI 2.0b | (2)* 8K @30 Hz + (1) 4K @60 Hz |
| | | | |
| HP ZBook Firefly G11 A | (2) Thunderbolt™ 4 with USB4™ Type-C® 40 Gbps signaling rate(USB Power Delivery,DisplayPort™ 1.4) | (1) HDMI 2.0b | (2)* 8K @30 Hz + (1) 4K @60 Hz |

1 Mini DisplayPort™ 1.4 with dGPU, mini DisplayPort™ 1.2 with iGPU.

2 HDMI 2.0b with dGPU; HDMI 1.4 with iGPU.

3 BC 1.2 (Battery Charging) provides higher amperage for charging.

External display resolutions when connected directly to a ZBook.

- For DP1.4 DSC, the resolution up to 8K @60 Hz*
- For DP1.3/DP1.4, the resolution up to 8K @30 Hz*
- For DP1.2, the resolution up to 4K @60 Hz*
- For HDMI 2.1, the resolution up to 8K @30 Hz*
- For HDMI 2.0, the resolution up to 4K @60 Hz*
- For HDMI 1.4b, the resolution up to 4K @30 Hz*

* Resolutions cannot be summed up. Max resolution of each display will be adjusted automatically when connecting multiple display on the host.

Table 3: HP ZBook port summary - DP1.4 DSC for dGPU only.

| | iGPU | | dPGU | | | |
|-------------------------|-------------|----------------------|-------------|-------------------------|-------------|-------------------------|
| | Intel® | | NVIDIA® | | AMD | |
| | USB-Type C* | Additional ports | USB-Type C* | Additional ports | USB-Type C* | Additional ports |
| ZBook Firefly G8 | DP 1.4 | HDMI 2.0 | NA | NA | NA | NA |
| ZBook Power G8 | DP 1.4 | HDMI 2.0 | NA | NA | NA | NA |
| ZBook Studio G8 | DP 1.4 | HDMI 2.0b mDP 1.4 | NA | HDMI 2.1 mDP 1.4 DSC | NA | NA |
| ZBook Fury G8 | DP 1.4 | HDMI 2.0b mDP 1.4 | DP 1.4 DSC | HDMI 2.1 mDP 1.4 DSC | DP 1.4 DSC | HDMI 2.1 mDP 1.4 DSC |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

| | iGPU | | | | dPGU | |
|----------------------------|--|-------------------|-------------|----------------------|-------------|------------------|
| | Intel® | | NVIDIA® | | AMD | |
| | USB-Type C* | Additional ports | USB-Type C* | Additional ports | USB-Type C* | Additional ports |
| ZBook Power G9 | DP 1.4 | HDMI 2.0b | NA | NA | NA | NA |
| ZBook Studio G9 | DP 1.4 | NA | DP 1.4 DSC | NA | NA | NA |
| ZBook Fury G9 | DP 1.4 | HDMI 2.0b mDP 1.4 | DP 1.4 DSC | HDMI 2.1 mDP 1.4 DSC | NA | NA |
| ZBook Firefly G10 | DP 1.4 | HDMI 2.0b mDP 1.4 | NA | NA | NA | NA |
| ZBook Firefly G10A | DP 1.4 | HDMI 2.0b mDP 1.4 | NA | NA | NA | NA |
| ZBook Power G10 | DP 1.4 | HDMI 2.0b | DP 1.4 DSC | NA | NA | NA |
| ZBook Power G10A | DP 1.4 | HDMI 2.1 | DP 1.4 DSC | NA | NA | NA |
| ZBook Studio G10 | DP 1.4 | NA | DP 1.4 DSC | NA | NA | NA |
| ZBook Fury G10 | DP 1.4 | HDMI 2.0b mDP 1.4 | DP 1.4 DSC | HDMI 2.1 mDP 1.4 DSC | NA | NA |
| ZBook Firefly G11 | DP 1.4 | HDMI 2.0b mDP 1.4 | NA | NA | NA | NA |
| ZBook Firefly G11 A | DP 1.4 | HDMI 2.0b mDP 1.4 | NA | NA | NA | NA |
| ZBook Power G11 | DP 1.4 | HDMI 2.0b | DP 1.4 DSC | NA | NA | NA |
| ZBook Power G11 A | DP 1.4 | HDMI 2.1 | DP 1.4 DSC | NA | NA | NA |
| ZBook Studio G11 | DP 2.1 (TBT port/ Left) DP 1.4 (MF port/ Right) | NA | DP 1.4 DSC | NA | NA | NA |
| ZBook Fury G11 | DP 1.4 | HDMI 2.0b mDP 1.4 | DP 1.4 DSC | HDMI 2.1 mDP 1.4 DSC | NA | NA |

DP1.4 * Intel TGL worldwide silicon issues cannot be fixed so that DSC is disabled on docking (MST mode), but it's still supported with direct output (SST mode).



Docking Station Considerations

HP offers Thunderbolt™ docks and USB Type-C® docks. Table 4 summarizes supported docks by system, along with power and charging notes. HP Docking Stations recommended for HP ZBooks include the HP Thunderbolt G4 Dock (120W and 280W), the HP USB-C® Dock G5 (120W), and the HP USB C®/A Universal Dock G2 (120W). Check compatibility on <https://pcb.inc.hp.com/> and search by notebook.



Contents & navigation

| | |
|---------------------------------------|----------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Consider power requirements when choosing a dock. For example, the HP Thunderbolt 120W G4 Dock fully functions on HP ZBooks, but some models require additional power for charging. In that case, order the HP Thunderbolt 280W G4 Dock. The combo cable connects the dock to the host system's Thunderbolt™ 4 or USB-C® port and uses a separate barrel connector to provide power.

Due to space limitations, the tables in this document use the following abbreviations:

FPC. Full Performance Charging.

CWW. Charging with warning . The HP ZBook will charge with this warning message: "HP Notifications - Smart AC adapter power output is too low for this computer." or "HP Notifications - For full performance, connect a higher capacity power adapter."

MF. Multi-function mode.

DSC. Display Stream Compression.

Docking Station SKUs

- HP Thunderbolt 120W G4 Dock (4JOA2AA)
- HP Thunderbolt 280W G4 Dock with Combo Cables (4JOG4AA)
- HP USB-C® Dock G5 (5TW10AA)
- HP USB-C®/ A Universal Dock G2 (5TW13AA)

Table 4: HP ZBook Docking station compatibility and support matrix

| Host | HP Thunderbolt 120W G4 Dock | | HP Thunderbolt 280W G4 Dock | | HP USB-C® Dock G5 (120W) | | HP USB-C®/A Universal Dock G2 (120W) | |
|--|-----------------------------|-----|-----------------------------|-----|--------------------------|-----|--------------------------------------|-----|
| | FPC | CWW | FPC | CWW | FPC | CWW | FPC | CWW |
| HP ZBook Studio G8 | | X | X | | | X | | X |
| HP ZBook Fury 15 G8 | | X | X | | | X | | X |
| HP ZBook Fury 17 G8 | | X | X | | | X | | X |
| HP ZBook Power G8 | | X | X | | | X | | X |
| HP ZBook Firefly 15 G8 | X | | X | | X | | X | |
| HP ZBook Firefly 15 G8 | X | | X | | X | | X | |
| HP ZBook Firefly 14 G7 HP ZBook Firefly 15 G7 | X | | X | | X | | X | |
| HP ZBook Power G7 | | X | X | | | X | | X |
| HP ZBook Studio G7 HP ZBook Create G7 | | X | X | | | X | | X |
| HP ZBook Fury 15 G7 HP ZBook Fury 17 G7 | | X | X | | | X | | X |
| ZBook Firefly G9 | X | | X | | X | | X | |
| ZBook Power G9 | | X | X | | | X | | X |
| ZBook Studio G9 | | X | X | | | X | | X |
| ZBook Fury G9 | | X | X | | | X | | X |

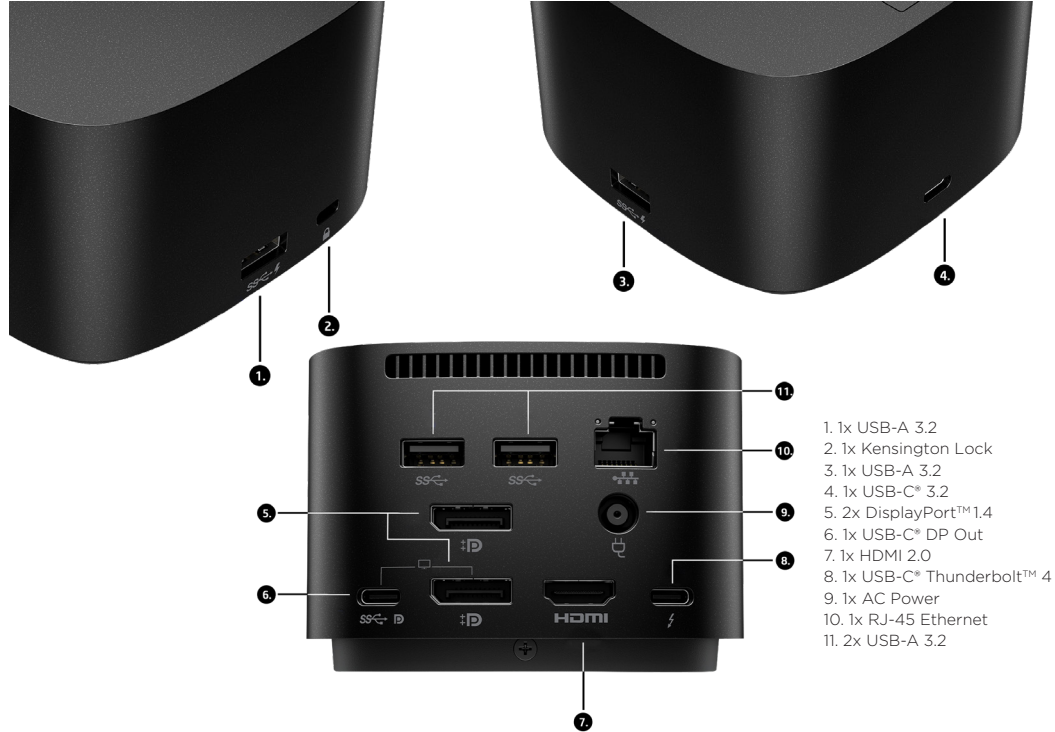


| | | | | | |
|---------------------------|---|---|---|---|---|
| ZBook Studio G10 | X | X | | X | X |
| ZBook Fury G10 | X | X | | X | X |
| ZBook Power G10 | X | X | | X | X |
| ZBook Power G10A | | X | | X | X |
| ZBook Firefly G10 | X | X | X | | X |
| ZBook Firefly G10A | X | X | X | | X |

Contents & navigation

| | |
|--|--------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock 18-20 G2 (120W) | 18-20 |
| Glossary | 21-22 |

HP Thunderbolt Dock G4 (120W/280W)



Ports HP Thunderbolt Dock G4

The HP Thunderbolt 120W and 280W G4 Dock ports include:

- (1) USB-C® 3.2 Gen 2 DisplayPort™
- (1) Thunderbolt™ 4 port
- (1) HDMI 2.0 port
- (2) DisplayPort™ 1.4 ports

Tables 5-8 list supported configurations based on a Thunderbolt™ host with a single and dual DisplayPort™ streams, supported resolutions, ports, and DisplayPort™ requirements (DisplayPort™ 1.2, DisplayPort™ 1.3/14, and DisplayPort™ 1.4 with DSC).

HP ZBooks (Thunderbolt™ hosts) have dual DisplayPort™ streams, except for HP ZHAN 99, which has a single DisplayPort™ stream. A non-Thunderbolt™ host with high resolution refers to four (4) lane DisplayPort™. A non-Thunderbolt™ multifunction host refers to two (2) lane DisplayPort™.

Configuration notes: HP ZBook and the HP Thunderbolt Dock G4

- The number of displays supported, and their resolution depend on the host. HP ZBooks support DisplayPort™ 1.2, 1.3, or 1.4 and/or Thunderbolt™ 4.
- For USB-C® functionality, the host HP ZBook must support the DisplayPort™ Alt mode (also called USB-C® Video) protocol through its USB-C® port. Thunderbolt™-enabled notebooks will function at USB-C® speeds.
- HP ZBooks based on 10th gen Intel® Core™ processors with DisplayPort™ 1.2 support two (2) 4K displays at 60 Hz.



Technical Whitepaper

- If the host does not have Thunderbolt™ 4 and is plugged into the HP Thunderbolt Dock G4, the Thunderbolt™ 4 (port 12) will have USB 3.1 Gen 2 functionality with video.
- For HP ZBooks with Thunderbolt™ 3 that support DisplayPort™ 1.3: if two (2) or more displays are attached via the two (2) DisplayPort™ (port 8) or USB-C® DisplayPort™ (port 9), the Thunderbolt™ 3 port (port 12) is limited to displays with a resolution of 2560 x 1440 at 60 Hz.
- The HP Thunderbolt Dock G4 is DSC-ready (Display Stream Compression). Hosts that support DisplayPort™ 1.4 DSC can connect to three (3) 4K displays at 60 Hz. Enables support of higher resolution displays, typically 3:1.

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Table 5: Single Display HP Thunderbolt Dock G4

| Single Display Configuration | Port | DisplayPort™ Version | | | | | | | | | | | |
|---|------------------------|--|---------|---------|---|---------|---------|---------------------------------------|---------|---------|--------------------------------------|------------|---------|
| | | Thunderbolt™ host single DisplayPort™ stream | | | Thunderbolt™ host dual DisplayPort™ streams | | | Non-Thunderbolt™ host high resolution | | | Non-Thunderbolt™ host multi-function | | |
| | | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 MF | 1.3/1.4 MF | 1.4 DSC |
| (1) FHD | Any Port | X | X | X | X | X | X | X | X | X | X | X | X |
| (1) 2.5K | Any Port | X | X | X | X | X | X | X | X | X | X | X | X |
| (1) 3K | Any Port | X | X | X | X | X | X | X | X | X | X | X | X |
| (1) 4K UHD/DCI @30 Hz | Any Port | X | X | X | X | X | X | X | X | X | X | X | X |
| (1) 4K UHD/DCI | Any Port | X | X | X | X | X | X | X | X | X | - | - | X |
| (1) 5K single cable @30 Hz | Any Port | X | X | X | X | X | X | X | X | X | - | X | X |
| (1) 5K single cable | Any Port | - | X | X | - | X | X | - | X | X | - | - | X |
| (1) 5K dual cable | Two DisplayPort™ Ports | - | X | X | - | X | X | - | X | X | - | - | X |
| (1) 5K Thunderbolt™ (multiple tiles) | Thunderbolt™ Port | - | X | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (1) 6K single cable @30 Hz | Any Port | X | X | X | X | X | X | X | X | X | - | - | X |
| (1) 6K single cable | Any Port | - | - | X | - | - | X | - | - | X | - | - | X |
| (1) 6K Thunderbolt™ (multiple tiles) | Thunderbolt™ Port | - | - | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (1) 8K single cable @30 Hz | Any Port | - | X | X | - | X | X | - | X | X | - | - | X |
| (1) 8K single cable | Any Port | - | - | X | - | - | X | - | - | X | - | - | - |
| (1) 8K dual cable | Two DisplayPort™ Ports | - | - | X | - | - | X | - | - | X | - | - | - |
| (1) 8K Thunderbolt™ (multiple tiles) @30 Hz | Thunderbolt™ Port | - | X | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (1) 8K Thunderbolt™ (multiple tiles) | Thunderbolt™ Port | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |



Table 6: Dual Displays HP Thunderbolt Dock G4

| Dual Display Configuration | Port | DisplayPort™ Version | | | | | | | | | | | |
|-------------------------------------|--|--|---------|---------|---|---------|---------|---------------------------------------|---------|---------|--------------------------------------|------------|------------|
| | | Thunderbolt™ host single DisplayPort™ stream | | | Thunderbolt™ host dual DisplayPort™ streams | | | Non-Thunderbolt™ host High Resolution | | | Non-Thunderbolt™ host multi-function | | |
| | | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 MF | 1.3/1.4 MF | 1.4 MF DSC |
| (2) FHD | Any 2 Ports | X | X | X | X | X | X | X | X | X | X | X | X |
| (2) 2.5K @30 Hz | Any 2 Ports | X | X | X | X | X | X | X | X | X | X | X | X |
| (2) 2.5K | Any 2 Ports | X | X | X | X | X | X | X | X | X | - | X | X |
| (1) 4K DCI @30 Hz + (1) FHD @30 Hz | Any 2 Ports | X | X | X | X | X | X | X | X | X | X | X | X |
| (1) 4K DCI + (1) FHD | Any 2 Ports | X | X | X | X | X | X | X | X | X | - | - | X |
| (1) 4K DCI @30 Hz + (1) 2.5K @30 Hz | Any 2 Ports | X | X | X | X | X | X | X | X | X | - | X | X |
| (1) 4K DCI + (1) 2.5K | Any 2 Ports | - | X | X | X | X | X | - | X | X | - | - | X |
| (2) 4K UHD @30 Hz | Any 2 Ports | X | X | X | X | X | X | X | X | X | - | X | X |
| (2) 4K UHD | Any 2 Ports | - | X | X | - | X | X | - | X | X | - | - | X |
| (2) 4K DCI @30 Hz | Any 2 Ports | X | X | X | X | X | X | X | X | X | - | - | X |
| (2) 4K DCI | Any 2 Ports | - | - | X | - | - | X | - | - | X | - | - | X |
| (2) 5K single cable @30 Hz | Any 2 Ports | - | X | X | - | X | X | - | X | X | - | - | X |
| (2) 5K single cable | Any 2 Ports | - | - | X | - | - | X | - | - | X | - | - | - |
| (1) 5K dual cable + (1) 2.5K | Both DisplayPort™ Ports for 5K+ 2.5K on another port | - | - | X | - | - | X | - | - | X | - | - | X |
| (1) 5K dual cable + (1) 4K | Both DisplayPort™ Ports for 5K + 4K on another port | - | - | X | - | - | X | - | - | X | - | - | X |
| (2) 8K single cable @30 Hz | Any 2 Ports | - | - | X | - | - | X | - | - | X | - | - | - |
| (2) 8K single cable | Any 2 Ports | - | - | X | - | - | X | - | - | X | - | - | - |

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |



Table 7: Triple Displays HP Thunderbolt Dock G4

| Triple Display Configuration | Port | DisplayPort™ Version | | | | | | | | | | | |
|---|--|--|---------|---------|---|---------|---------|---------------------------------------|---------|---------|--------------------------------------|------------|---------|
| | | Thunderbolt™ host single DisplayPort™ stream | | | Thunderbolt™ host dual DisplayPort™ streams | | | Non-Thunderbolt™ host High Resolution | | | Non-Thunderbolt™ host multi-function | | |
| | | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 MF | 1.3/1.4 MF | 1.4 DSC |
| (3) FHD @30 Hz | Any 3 Ports | X | X | X | X | X | X | X | X | X | X | X | X |
| (3) FHD | Any 3 Ports | X | X | X | X | X | X | X | X | X | - | X | X |
| (3) 2.5K @30 Hz | Any 3 Ports | X | X | X | X | X | X | X | X | X | - | X | X |
| (3) 2.5K | Any 3 Ports | - | X | X | - | X | X | - | X | X | - | - | X |
| (3) 4K UHD @30 Hz | Any 3 Ports | - | X | X | - | X | X | - | X | X | - | - | X |
| (3) 4K UHD | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | X |
| (3) 4K DCI @30 Hz | Any 3 Ports | - | X | X | - | X | X | - | X | X | - | - | X |
| (3) 4K DCI | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | X |
| (3) 5K single cable @30 Hz | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | X |
| (3) 5K single cable | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | X |
| (3) 8K @30 Hz | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | X |
| (3) 8K | Not supported | - | - | - | - | - | - | - | - | - | - | - | - |
| (2) 5K single cable @30 Hz + (1) FHD @30 Hz | Thunderbolt™ Port limited to 4K @30 Hz without DSC | - | X | X | - | X | X | - | X | X | - | - | - |
| (2) 5K single cable + (1) FHD | Thunderbolt™ Port limited to 4K @30 Hz without DSC | - | - | X | - | - | X | - | - | X | - | - | X |
| (2) 5K single cable @30 Hz + (1) 2.5K @30 Hz | Thunderbolt™ Port limited to 4K @30 Hz without DSC | - | X | X | - | X | X | - | - | X | - | - | X |
| (2) 5K single cable + (1) 2.5K | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | - |
| (2) 5K single cable @30 Hz + (1) 4K UHD @30 Hz | Thunderbolt™ Port limited to 4K @30 Hz without DSC | - | - | X | - | - | X | - | - | X | - | - | X |
| (2) 5K single cable + (1) 4K UHD | Any 3 Ports | - | - | X | - | - | X | - | - | X | - | - | - |

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Table 8: Quad Displays HP Thunderbolt Dock G4

| Quad Display Configuration | Port | DisplayPort™ | | | | | | | | | | | |
|---|---|--|---------|---------|---|---------|---------|---------------------------------------|---------|---------|--------------------------------------|------------|------------|
| | | Thunderbolt™ host single DisplayPort™ stream | | | Thunderbolt™ host dual DisplayPort™ streams | | | Non-Thunderbolt™ host High Resolution | | | Non-Thunderbolt™ host multi-function | | |
| | | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 MF | 1.3/1.4 MF | 1.4 MF DSC |
| (4) FHD @30 Hz | Any 4 ports | X | X | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) FHD | Any 4 ports | X | X | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 2.5K @30 Hz + FHD @30 Hz | Any 4 ports | X | X | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 2.5K + FHD | Any 4 ports | - | X | X | - | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 4K UH @30 Hz + FHD @30 Hz | Any 4 ports | - | X | X | - | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 4K UHD + FHD | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 4K DCI @30 Hz + FHD @30 Hz | Any 4 ports | - | X | X | - | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 4K DCI + FHD | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 5K single cable @30 Hz + FHD @30 Hz | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 5K single cable + FHD | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 8K @30 Hz + FHD @30 Hz | Not supported (Thunderbolt™ limited to 5K @60 Hz) | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 8K + FHD | Not Supported | - | - | - | - | - | - | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 2.5K @30 Hz | Any 4 ports | X | X | X | X | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 2.5K | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 4K UHD @30 Hz | Any 4 ports | - | X | X | - | X | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 4K UHD | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 4K DCI @30 Hz | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 4K DCI | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 5K single cable @30 Hz | Any 4 ports | - | - | X | - | - | X | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 5K single cable | N/A | - | - | - | - | - | - | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 8K @30 Hz | N/A | - | - | - | - | - | - | N/A | N/A | N/A | N/A | N/A | N/A |
| (4) 8K | N/A | - | - | - | - | - | - | N/A | N/A | N/A | N/A | N/A | N/A |

Configuration notes: HP Thunderbolt Dock G4 Tables 5-8

- ¹ MST Hub refers to DisplayPort™ ports and Type-C* DisplayPort™ downstream ports.
- ² USB-C* DP Alt port and DisplayPort™ bottom port are exclusive (only one may be activate at a time).
- ³ Thunderbolt™ video may use one (1) or two (2) DisplayPort™ streams (x4 or x8). When it is using two (2) streams, MST Hub does not support video.
- ⁴ Chart priority MST Hub over Thunderbolt™ (as MST Hub has up to 3 displays).
- ⁵ Unless noted, resolution is driven at 8bpp, 60 Hz.
- ⁶ Chart shows capability of dock. Actual support depends on host. For example, some hosts cannot support 8K. Some host support three (3) displays while others support four (4) or more. Some hosts use two (2) internal pipes to support one (1) display (such as an 8K display).
- ⁷ The maximum number of supported displays is reduced by one (1) when using an 8K external display.
- ⁸ On displays with the dual DisplayPort™ cable, both cables must be attached to the dock DisplayPort™ ports.



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|--------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Adding additional displays

For five (5) display configurations on HP ZBooks, use the charts plus the internal panel or mini-DP/HDMI.

- System must be in hybrid graphics mode with NVIDIA® graphics.
- System may be in hybrid or dGPU only mode with AMD graphics.
- System must be in hybrid graphics mode and must have AMD graphics HP USB-C® Dock G5 (120W).

HP USB-C® Dock G5 (120W)



Back view

Ports HP USB-C® Dock G5

The HP USB-C® Dock G5 120W ports include:

- (1) HDMI 2.0 port
- (2) DisplayPort™ 1.4 ports

Configuration notes: HP USB-C® Dock G5

1. For USB-C® functionality, host PC must support the DisplayPort™ Alt mode protocol through its USB-C® port. Thunderbolt™-enabled notebooks will function at USB-C® speeds.

The number of displays supported and their resolution depend on the host.

Table 9: Video resolution for USB-C® Dock G5

| Number of Displays | Configuration | Output Ports |
|--------------------|---------------------|---------------------|
| (1) One | (1) 2.5K | Any |
| | (1) 4K | Any |
| | (1) 5k single cable | Either DisplayPort™ |
| | (1) 5k dual cable | Both DisplayPort™ |
| | (1) 8k dual cable | Both DisplayPort™ |
| | (1) 8k single cable | Any 2 |
| (2) Two | (2) FHD | Any 2 |
| | (2) 2.5K | Any 2 |
| | (1) 4K and (1) FHD | Any 2 |
| | (2) 4K | Any 2 |



Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Table 10: Single Display HP USB-C® Dock G5

| Single Display Configuration | MST Ports DisplayPort™ 1, DisplayPort™ 2, HDMI | DisplayPort™ high-resolution host | | | DisplayPort™ host multi-function | | |
|---|---|-----------------------------------|---------|---------|----------------------------------|------------|------------|
| | | DisplayPort™ Version | | | | | |
| | | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 MF | 1.3/1.4 MF | 1.4 MF DSC |
| (1) FHD | Any Port | X | X | X | X | X | X |
| (1) 2.5K | Any Port | X | X | X | X | X | X |
| (1) 3K | Any Port | X | X | X | X | X | X |
| (1) 4K UHD/DCI @30 Hz | Any Port | X | X | X | X | X | X |
| (1) 4K UHD/DCI | Any Port | X | X | X | - | - | X |
| (1) 5K single cable @30 Hz | Any Port | X | X | X | - | X | X |
| (1) 5K single cable | Any Port | - | X | X | - | - | X |
| (1) 5K dual cable | Two DisplayPort™ Ports | - | X | X | - | - | X |
| (1) 5K Thunderbolt™ (multiple tiles) | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |
| (1) 6K single cable @30 Hz | Any Port | X | X | X | - | - | X |
| (1) 6K single cable | Any Port | - | - | X | - | - | X |
| (1) 6K Thunderbolt™ (multiple tiles) | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |
| (1) 8K single cable @30 Hz | Any Port | - | X | X | - | - | X |
| (1) 8K single cable | Any Port | - | - | X | - | - | - |
| (1) 8K dual cable | Two DP Ports | - | - | X | - | - | - |
| (1) 8K Thunderbolt™ (multiple tiles) @30 Hz | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |
| (1) 8K Thunderbolt™ (multiple tiles) | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |

Table 11: Dual Displays HP USB-C® Dock G5

| Dual Display Configuration | MST Ports DisplayPort™ 1, DisplayPort™ 2, HDMI | DisplayPort™ high-resolution host | | | DisplayPort™ host multi-function | | |
|-------------------------------------|---|-----------------------------------|---------|---------|----------------------------------|------------|------------|
| | | DisplayPort™ Version | | | | | |
| | | 1.2 | 1.3/1.4 | 1.4 DSC | 1.2 MF | 1.3/1.4 MF | 1.4 MF DSC |
| (2) FHD | Any 2 Ports | X | X | X | X | X | X |
| (2) 2.5K @30 Hz | Any 2 Ports | X | X | X | X | X | X |
| (2) 2.5K | Any 2 Ports | X | X | X | - | X | X |
| (1) 4K DCI @30 Hz + (1) FHD @30 Hz | Any 2 Ports | X | X | X | X | X | X |
| (1) 4K DCI + (1) FHD | Any 2 Ports | X | X | X | - | - | X |
| (1) 4K DCI @30 Hz + (1) 2.5K @30 Hz | Any 2 Ports | X | X | X | - | X | X |
| (1) 4K DCI + (1) 2.5K | Any 2 Ports | - | X | X | - | - | X |
| (2) 4K UHD @30 Hz | Any 2 Ports | X | X | X | - | X | X |
| (2) 4K UHD | Any 2 Ports | - | X | X | - | - | X |
| (2) 4K DCI @30 Hz | Any 2 Ports | X | X | X | - | - | X |
| (2) 4K DCI | Any 2 Ports | - | - | X | - | - | X |
| (2) 5K single cable @30 Hz | Any 2 Ports | - | X | X | - | - | X |
| (2) 5K single cable | Any 2 Ports | - | - | X | - | - | - |
| (1) 5K dual cable + (1) 2.5K | Both DisplayPort™ Ports for 5K + 2.5K on HDMI | - | - | X | - | - | X |
| (1) 5K dual cable + (1) 4K | Both DisplayPort™ Ports for 5K + 4K on HDMI | - | - | X | - | - | X |
| (2) 8K single cable @30 Hz | Any 2 Ports | - | - | X | - | - | - |
| (2) 8K single cable | Any 2 Ports | - | - | X | - | - | - |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Table 12: Triple Displays HP USB-C® Dock G5

| Triple Display Configuration | MST Ports DisplayPort™ 1, DisplayPort™ 2, HDMI | DisplayPort™ high-resolution host | | | DisplayPort™ host multi-function | | |
|---|---|-----------------------------------|-------------|------------|----------------------------------|-------------------|------------------|
| | | DisplayPort™ Version | | | | | |
| | | 1.2 | 1.3/ 1.4 | 1.4 DSC | 1.2 MF | 1.3/ 1.4 MF | 1.4 MF DSC |
| (3) FHD @30 Hz | All 3 Ports | X | X | X | X | X | X |
| (3) FHD | All 3 Ports | X | X | X | - | X | X |
| (3) 2.5K @30 Hz | All 3 Ports | X | X | X | - | X | X |
| (3) 2.5K | All 3 Ports | - | X | X | - | - | X |
| (3) 4K UHD @30 Hz | All 3 Ports | - | X | X | - | - | X |
| (3) 4K UHD | All 3 Ports | - | - | X | - | - | X |
| (3) 4K DCI @30 Hz | All 3 Ports | - | X | X | - | - | X |
| (3) 4K DCI | All 3 Ports | - | - | X | - | - | X |
| (3) 5K single cable @30 Hz | All 3 Ports | - | - | X | - | - | - |
| (3) 5K single cable | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 8K @30 Hz | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |
| (3) 8K | Not supported | N/A | N/A | N/A | N/A | N/A | N/A |
| (2) 5K single cable @30 Hz + (1) FHD @30 Hz | All 3 Ports | - | X | X | - | - | X |
| (2) 5K single cable + (1) FHD | 5K on DPs + FHD on HDMI | - | - | X | - | - | - |
| (2) 5K single cable @30 Hz + (1) 2.5K @30 Hz | All 3 Ports | - | X | X | - | - | X |
| (2) 5K single cable + (1) 2.5K | 5K on DPs + 2.5K on HDMI | - | - | X | - | - | - |
| (2) 5K single cable @30 Hz + (1) 4K UHD @30 Hz | All 3 Ports | - | - | X | - | - | X |
| (2) 5K single cable + (1) 4K UHD | 5K on DPs + 4K on HDMI | - | - | X | - | - | - |

Configuration notes: HP USB-C® Dock G5

¹ For USB-C® functionality, host PC must support the DisplayPort™ Alt mode protocol through its USB-C® port. Thunderbolt™-enabled notebooks will function at USB-C® speeds.

² HDMI is limited to 4K @60 Hz DSC.

³ DSC is disabled when display is attached to the VGA port or to an external DisplayPort™-to-VGA dongle.

⁴ DisplayPort™ Multi-stream (MST) mode is not supported on the DisplayPort™ and Type-C® DisplayPort™ Ports.

⁵ Unless noted, resolution is driven at 8bpp, 60Hz.

⁶ Chart shows capability of dock. Actual support depends on host. For example, some host cannot support 8K. Some host support 3 simultaneous displays while others support 4 or more. Some hosts use 2 internal pipes to support a single display (such as an 8K display).

⁷ The maximum number of supported displays is reduced by one (1) when using an 8K external display.

⁸ On displays with the dual DisplayPort™ cable, both cables must be attached to the docks DisplayPort™ ports.



HP USB-C®/A Universal Dock G2 (120W)

Contents & navigation

| | |
|---|--------------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |



Back view

Ports USB-C®/A Universal Dock G2

The HP USB-C®/A Universal Dock G2 120W ports include:

- (1) HDMI 2.0 port
- (2) DisplayPort™ 1.2 ports

The number of displays supported and their resolution depend on the host.

Table 13: Single Display on USB-C®/A Universal Dock G2

| Single Display Configuration | MST Ports | DisplayPort™ high-resolution host | | DisplayPort™ host multi-function | |
|--------------------------------------|---|-----------------------------------|----------|----------------------------------|----------------|
| | | 1.2 | 1.3/ 1.4 | 1.2 MF | 1.3 MF/ 1.4 MF |
| (1) FHD | Any Port | X | X | X | X |
| (1) 2.5K | Any Port | X | X | X | X |
| (1) 3K | Any Port | X | X | - | X |
| (1) 4K UHD/DCI @30 Hz | Any Port | X | X | X | X |
| (1) 4K UHD/DCI | Any Port, but not HDMI with DisplayPort™ 1.2 MF | X | X | - | X |
| (1) 5K Ultra-Wide (5120X1440) @60 Hz | Any Port, but not HDMI with DisplayPort™ 1.2 MF | X | X | - | X |
| (1) 5K single cable @30 Hz | Either DisplayPort™ Ports | N/A | N/A | N/A | N/A |
| (1) 5K single cable | Either DisplayPort™ Ports | N/A | N/A | N/A | N/A |
| (1) 5K dual cable | Both DisplayPort™ Ports (Windows only) | X | X | X | X |
| (1) 5K Thunderbolt™ (multiple tiles) | Not supported | N/A | N/A | N/A | N/A |
| (1) 6K single cable @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (1) 6K single cable | Not supported | N/A | N/A | N/A | N/A |
| (1) 6K Thunderbolt™ (multiple tiles) | Not supported | N/A | N/A | N/A | N/A |
| (1) 8K single cable @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (1) 8K single cable | Not supported | N/A | N/A | N/A | N/A |
| (1) 8K dual cable | Not supported | N/A | N/A | N/A | N/A |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

| | MST Ports | DisplayPort™ high-resolution host | | DisplayPort™ host multi-function | |
|---|--------------------------------------|-----------------------------------|----------|----------------------------------|----------------|
| | | DisplayPort™ Version | | | |
| Single Display Configuration | DisplayPort™ 1, DisplayPort™ 2, HDMI | 1.2 | 1.3/ 1.4 | 1.2 MF | 1.3 MF/ 1.4 MF |
| (1) 8K Thunderbolt™ (multiple tiles) @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (1) 8K Thunderbolt™ (multiple tiles) | Not supported | N/A | N/A | N/A | N/A |

Table 14: Dual Displays on USB-C®/A Universal Dock G2

| | MST Ports | DisplayPort™ high-resolution host | | DisplayPort™ host multi-function | |
|-------------------------------------|--|-----------------------------------|----------|----------------------------------|----------------|
| | | DisplayPort™ Version | | | |
| Single Display Configuration | DisplayPort™ 1, DisplayPort™ 2, HDMI | 1.2 | 1.3/ 1.4 | 1.2 MF | 1.3 MF/ 1.4 MF |
| (2) FHD | Any 2 Ports | X | X | X | X |
| (2) 2.5K @30 Hz | Any 2 Ports | X | X | X | X |
| (2) 2.5K | Any 2 Ports | X | X | X | X |
| (1) 4K DCI @30 Hz + (1) FHD @30 Hz | Any 2 Ports | X | X | X | X |
| (1) 4K DCI + (1) FHD | Any 2 Ports, but not 4K on HDMI with DisplayPort™ 1.2 MF | X | X | - | X |
| (1) 4K DCI @30 Hz + (1) 2.5K @30 Hz | Any 2 Ports | X | X | X | X |
| (1) 4K DCI + (1) 2.5K | Any 2 Ports, but not 4K on HDMI with DisplayPort™ 1.2 MF | X | X | - | X |
| (2) 4K UHD @30 Hz | Any 2 Ports | X | X | X | X |
| (2) 4K UHD | Any 2 Ports, but not 4K on HDMI with DisplayPort™ 1.2 MF | X | X | - | X |
| (2) 4K DCI @30 Hz | Any 2 Ports | X | X | X | X |
| (2) 4K DCI | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable | Not supported | N/A | N/A | N/A | N/A |
| (1) 5K dual cable + (1) 2.5K | Both DisplayPort™ Ports for 5K (Windows only) + HDMI | X | X | X | X |
| (1) 5K dual cable + (1) 4K | Both DisplayPort™ Ports for 5K (Windows only) + HDMI | X | X | - | X |
| (2) 8K single cable @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (2) 8K single cable | Not supported | N/A | N/A | N/A | N/A |

Table 15: Triple Displays on USB-C®/A Universal Dock G2

| | MST Ports | DisplayPort™ high-resolution host | | DisplayPort™ host multi-function | |
|------------------------------|--------------------------------------|-----------------------------------|---------|----------------------------------|----------------|
| | | DisplayPort™ Version | | | |
| Triple Display Configuration | DisplayPort™ 1, DisplayPort™ 2, HDMI | 1.2 | 1.3/1.4 | 1.2 MF | 1.3 MF/ 1.4 MF |
| (3) FHD @30 Hz | All 3 Ports | X | X | X | X |
| (3) FHD | All 3 Ports | X | X | X | X |
| (3) 2.5K @30 Hz | All 3 Ports | X | X | X | X |
| (3) 2.5K | All 3 Ports | X | X | X | X |
| (3) 4K UHD @30 Hz | All 3 Ports | X | X | X | X |
| (3) 4K UHD | All 3 Ports | X | X | - | X |



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C* Dock G5 (120W) | 15-17 |
| HP USB-C/A* Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

| | MST Ports | DisplayPort™ high-resolution host | | DisplayPort™ host multi-function | |
|---|---------------|-----------------------------------|-----|----------------------------------|-----|
| | | DisplayPort™ Version | | | |
| (3) 4K DCI @30 Hz | All 3 Ports | X | X | X | X |
| (3) 4K DCI | Not supported | N/A | N/A | N/A | N/A |
| (3) 5K single cable @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (3) 5K single cable | Not supported | N/A | N/A | N/A | N/A |
| (3) 8K @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (3) 8K | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable @30 Hz + (1) FHD @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable + (1) FHD | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable @30 Hz + (1) 2.5K @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable + (1) 2.5K | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable @30 Hz + (1) 4K UHD @30 Hz | Not supported | N/A | N/A | N/A | N/A |
| (2) 5K single cable + (1) 4K UHD | Not supported | N/A | N/A | N/A | N/A |

Configuration notes: USB-C*/A Universal Dock G2

¹ DisplayLink drives all single and dual display combination in MF mode.

² Host GPU drives HDMI in High Resolution mode.

³ Host GPU drives HDMI when both DisplayPort™ ports are active.

⁴ In High Resolution mode, DisplayLink is running at USB 2.0 speed. This has significant performance impacts on DisplayPort™ 1 and DisplayPort™ 2 output.

⁵ When dock is attached to USB-A on host (using USB-A to USB-C* dongle), you are limited to two (2) displays.

⁶ DisplayLink DL-6950 (USB3.1 Gen1, DisplayPort™ 1.2, HDMI 2.0) supports a single (1) 4K @60 Hz (DCI), two (2) 4K @60 Hz (UHD).

⁷ Disable DisplayPort™ MST on displays with this feature (MST is not currently supported).



Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Glossary

Combo Cable

HP Thunderbolt 280W G4 Dock with Combo Cables connects the dock to the host system's Thunderbolt™ 4 or USB-C® port and uses a separate barrel connector to provide power over A/C passthrough up to 230W.

Display Stream Compression (DSC)

DSC is a VESA standard that enables visually lossless image compression to increase the amount of data carried by a display interface data rate, saving power. It reduces the video interface data rate, which reduces system power, prolongs battery life, and reduces interconnects, enabling sleeker designs.

DisplayPort™ Daisy Chain

Connecting a series of devices together using a single connection between each two devices. Daisy chainable displays have both a DisplayPort™ input and a DisplayPort™ output. The DisplayPort™ output connects to the next downstream display.

DisplayPort™ High Resolution

Refers to four (4) lane DisplayPort™.

DisplayPort™ Multi-function

Refers to two (2) lane DisplayPort™, aka Default mode.

Graphics Processing Units (GPUs)

- Integrated (iGPU). Graphics that is integrated with the processor. Also called Unified Memory Architecture (UMA) since it uses system memory instead of dedicated video memory. In HP ZBooks, it is primarily Intel® Integrated graphics.
- Discrete (dGPU). A separate graphics subsystem in a computer, such as a Mobile PCI Express Module (MXM) graphics, with dedicated video memory. In HP ZBooks, they are typically NVIDIA® Quadro® GPUs.
- Hybrid. The system uses iGPU for most tasks to conserve battery life, and switches to dGPU when higher performance is required. In a hybrid configuration, some displays are driven by iGPU while others are driven by dGPU.

Multi Stream Transport (MST) Hub

MST hubs are devices that take one (1) DisplayPort™ or mini DisplayPort™ video connection, and go to many video connections, usually extra DisplayPort™, mini DisplayPort™, DVI or HDMI connections. This is accomplished through DisplayPort™ MST, or Multi-Stream Transport function.

Resolution Definitions

- FHD = 1920 x1200 or 1920 x 1080
- 2.5K = 2560 x 1600 or 2560 x 1440
- 3K = 3440x1440
- 4K UHD = 3840 x 2160
- 4K DCI = 4096 x 2160
- 5K = 5120 x 2880
- 6K = 6016x3384 (Apple XDR)
- 8K = 7680 x 4320



Technical Whitepaper

Contents & navigation

| | |
|--------------------------------------|-------|
| Introduction | 2 |
| How to Use This Document | 2 |
| Host System Considerations | 2-8 |
| Docking Station Considerations | 9 |
| HP Thunderbolt Dock G4 (120W/280W) | 10-14 |
| HP USB-C® Dock G5 (120W) | 15-17 |
| HP USB-C/A® Universal Dock G2 (120W) | 18-20 |
| Glossary | 21-22 |

Thunderbolt™ 4

Thunderbolt™ 4 defines a superset of capabilities that runs on USB-C® connectors and cables. This enables docks and displays to connect to a Thunderbolt™ 3 port with a USB-C® connector.

Thunderbolt™ Cables

There are active, passive, and full-featured versions of Thunderbolt™ 4 cables on the market. A full-featured Thunderbolt™ 4 cable supports USB 3.1, DisplayPort™ 1.2, and Thunderbolt™. Use HP cables to avoid issues with improperly marked cables.

USB-C®

USB-C® is a specification for connectors and cables.

USB-C® High Resolution (a.k.a. Alt mode and USB-C® Video)

USB-C® High Resolutions requires the host PC to support the DisplayPort™ Alt mode protocol through its USB-C® port. Thunderbolt™-enabled notebooks will function at USB-C® speeds. Charging and port replication is supported on notebooks that have implemented USB-C® industry specifications. Alt mode includes support for DisplayPort™, Thunderbolt™ 4, and HDMI—all from the same USB-C® connector.

**Let us help you create amazing
business solutions today**

LEARN MORE

© Copyright 2024 HP Development Company, L.P. The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

DisplayPort™ and the DisplayPort™ logo are trademarks owned by the Video Electronics Standards Association (VESA®) in the United States and other countries. Thunderbolt and the Thunderbolt logo are trademarks of Intel Corporation or its subsidiaries in the U.S. and/or other countries. USB Type-C® and USB-C® are registered trademarks of USB Implementers Forum. NVIDIA, the NVIDIA logo, Quadro, and GeForce are trademarks and/or registered trademarks of NVIDIA Corporation in the U.S. and other countries. Windows® is a registered trademark of Microsoft Corporation in the United States and/or other countries.

4AA5-2657ENW, March 2024

