

# Intel® Whitebook

## LAPQC71A and LAPQC71B

### Product Specification

Regulatory Model Name:

QC7

Version 1.04

*September 2019*

Intel® LAPQC71A and LAPQC71B may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Current characterized errata, if any, are documented in this Product Specification.





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This product specification applies to only the standard Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B with BIOS identifier QCCFL357.86A.

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# Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B Identification Information

## Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B Identification Information

SA Revision	Product Code	BIOS Revision	Notes
K54902-301	BQC71ABBU6000	QCCFL357.86A.0038	1,2
K63034-301	BQC71AUBU6000	QCCFL357.86A.0038	1,2
K54906-301	BQC71BBBU6000	QCCFL357.86A.0038	1,2
K63036-301	BQC71BUBU6000	QCCFL357.86A.0038	1,2

Notes:

1. The SA number is found on the back cover.
2. The processors used on this SA revision may consist of the following components:

Device	Stepping	Spec Code
Intel® Core™ i7-9750H	U0	SRF6U

## Specification Changes or Clarifications

The table below indicates the Specification Changes or Specification Clarifications, if any, that apply to the Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B.

### Specification Changes or Clarifications

Date	Type of Change	Description of Changes or Clarifications
8 Jul 2019	Spec	System height measurement changed to a front to back range

## Errata

Current characterized errata, if any, will be documented in a separate section of this Product Specification.

# Preface

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This Product Specification specifies the layout, components, connectors, power and environmental features for the Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B.



## NOTE

In this document, the use of "Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B will refer to the LAPQC71A and LAPQC71B versions of the Intel® Whitebook.

## Intended Audience

This document is intended to provide technical information about LAPQC71A and LAPQC71B and its components to the vendors, system integrators, and other engineers and technicians who need this level of information. It is specifically *not* intended for general audiences.

## What This Document Contains

Chapter	Description
1	A description of the LAPQC71A and LAPQC71B features
2	A technical description of the LAPQC71A and LAPQC71B

## Typographical Conventions

This section contains information about the conventions used in this specification. Not all of these symbols and abbreviations appear in all specifications of this type.

## Notes, Cautions, and Warnings



### NOTE

*Notes call attention to important information.*



### CAUTION

*Cautions are included to help you avoid damaging hardware or losing data.*

## Other Common Notation

#	Used after a signal name to identify an active-low signal (such as USBP0#)
GB	Gigabyte (1,073,741,824 bytes)
GB/s	Gigabytes per second
Gb/s	Gigabits per second
KB	Kilobyte (1024 bytes)
Kb	Kilobit (1024 bits)
kb/s	1000 bits per second
MB	Megabyte (1,048,576 bytes)
MB/s	Megabytes per second
Mb	Megabit (1,048,576 bits)
Mb/s	Megabits per second
TDP	Thermal Design Power
Xxh	An address or data value ending with a lowercase h indicates a hexadecimal value.
x.x V	Volts. Voltages are DC unless otherwise specified.
*	This symbol is used to indicate third-party brands and names that are the property of their respective owners.

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# 1 Product Description

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## 1.1 Overview

The Intel® Whitebook LAPQC71A and Intel® Whitebook LAPQC71B are premium, metal, thin and light performance laptops.

## 1.2 Version Summary

There are two different versions of LAPQC71A and two different versions of LAPQC71B available which are summarized in Table 1. Unless otherwise noted in this document, not all features are available on all versions.

**Table 1. Version Summary**

Version	CPU	GPU	Color
BQC71ABBU6000	Intel® Core™ i7-9750H	GeForce® 1660 Ti	Black
BQC71AUBU6000	Intel® Core™ i7-9750H	GeForce 1660 Ti	Gunmetal
BQC71BBBU6000	Intel® Core™ i7-9750H	GeForce RTX 2070	Black
BQC71BUBU6000	Intel® Core™ i7-9750H	GeForce RTX 2070	Gunmetal

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<http://www.intel.com/content/www/us/en/products/docs/chipsets/high-definition-audio.html>

<http://www.intel.com/wireless>

<http://www.intel.com/technology>

## 1.3 Feature Summary

Table 2 summarizes the major features of the LAPQC71A and LAPQC71B.

**Table 2. Feature Summary**

Feature	LAPQC71A	LAPQC71B
Color	Black or Gunmetal	Black or Gunmetal
Materials	Magnesium Alloy	Magnesium Alloy
Processor	Intel® Core™ i7-9750H	Intel® Core™ i7-9750H
Chipset	Intel® HM370	Intel® HM370
Memory	2 DDR4 SO-DIMM Slots, 2666Mhz	2 DDR4 SO-DIMM Slots, 2666Mhz
Graphics	Nvidia* GeForce* GTX 1660 Ti	Nvidia GeForce RTX 2070 Max-Q
VRAM	6GB GDDR6	8GB GDDR6
Storage	1 M.2 22x80 PCIe x4 NVMe 1 M.2 22x80 PCIe x4 NVMe or SATA SSD Support for Intel® Optane™ Technology	1 M.2 22x80 PCIe x4 NVMe 1 M.2 22x80 PCIe x4 NVMe or SATA SSD Support for Intel® Optane™ Technology
Card Reader	SDXC v3.01 2-in-1 SD/SDHC/SDXC	SDXC v3.01 2-in-1 SD/SDHC/SDXC
Display Panel	Narrow Bezel IPS 15.6" FHD, 16:9 ratio, 144Hz, LED backlight, Response Time=5ms nominal	Narrow Bezel IPS 15.6" FHD, 16:9 ratio, 144Hz, LED backlight, Response Time=5ms nominal
Display Outputs	1 Full Size HDMI Output 1 DisplayPort via USB Type C	1 Full Size HDMI Output 1 DisplayPort via USB Type C
Audio	Realtek* ALC269M with Intel® HD Audio 1 3.5mm Audio Out Jack 1 3.5mm Microphone In Jack	Realtek ALC269M with Intel® HD Audio 1 3.5mm Audio Out Jack 1 3.5mm Microphone In Jack
Speakers	2 Built In, 2W each	2 Built In, 2W each
Microphones	2 Digital Microphones	2 Digital Microphones
Keyboard	Silent Mechanical with RGB backlight, 2.0mm travel	Silent Mechanical with RGB backlight, 2.0mm travel
Pointing Device	Glass Click Pad with Microsoft Precision Touchpad Driver Support Enable/Disable option with LED indicator	Glass Click Pad with Microsoft Precision Touchpad Driver Support Enable/Disable option with LED indicator
Camera	HD IR with Windows Hello Support	HD IR with Windows Hello Support
Wired LAN	Gigabit Ethernet (RJ-45)	Gigabit Ethernet (RJ-45)
Wireless LAN	Intel® WiFi 6 AX 200, Bluetooth* 5.0	Intel® WiFi 6 AX 200, Bluetooth 5.0
Power Supply	19.5V, 230W 100/240V AC 50/60Hz 1 Power Input Jack	19.5V, 230W 100/240V AC 50/60Hz 1 Power Input Jack
Battery	94Whr (8200mAh) with Fast Charge Support	94Whr (8200mAh) with Fast Charge Support
Power LED	Power On: White, Power Off: Off Suspend: Blinking White	Power On: White, Power Off: Off Suspend: Blinking White
Charging and Battery LED	Charging (Power On): Blinking White Charging (Power Off): Blinking White Battery Low (<6%): Amber Charging Finish (w/AC): White, w/o AC: Off	Charging (Power On): Blinking White Charging (Power Off): Blinking White Battery Low (<6%): Amber Charging Finish (w/AC): White, w/o AC: Off
Mode LED	Battery Saver: Both LEDs Off Balanced: Left LED on Performance: Both LEDs On	Battery Saver: Both LEDs Off Balanced: Left LED on Performance: Both LEDs On
Front Light Bar	RGB	RGB
USB	2 USB 3.1 (Gen 1) Type A 1 USB 3.1 (Gen 2) Type A 1 Type C Thunderbolt™ 3	2 USB 3.1 (Gen 1) Type A 1 USB 3.1 (Gen 2) Type A 1 Type C Thunderbolt™ 3
Size	356.4mm x 233.6mm x 20.5mm (front) to 21.4mm (back)	356.4mm x 233.6mm x 20.5mm (front) to 21.4mm (back)
Weight	1.85kg +/-5%	1.85kg +/-5%
Measured Acoustics <sup>1</sup>	Idle: 16.3dBA Battery Saver Mode: 34.7dBA Balanced Mode: 39.3dBA Performance Mode: 51.5dBA	Idle: 16.3dBA Battery Saver Mode: 34.7dBA Balanced Mode: 39.3dBA Performance Mode: 51.5dBA

Feature	LAPQC71A	LAPQC71B
Battery Life Estimates <sup>2</sup>	Idle: ~12 hours, 5 minutes Battery Saver Mode: ~10.75 hours Balanced Mode: ~10.5 hours Performance Mode: ~10 hours	Idle: ~12 hours Battery Saver Mode: ~10 hours Balanced Mode: ~10 hours Performance Mode: ~9.75 hours
Security	1 Kensington* Lock	1 Kensington Lock
Advanced Technologies Supported	Intel® Speed Shift Technology Intel® Turbo Boost Technology Intel® Virtualization Technology (VT-x) Intel® 64 Enhanced Intel® SpeedStep® Technology Intel® Flex Memory Access Intel® Hyper-Threading Technology Intel® Virtualization Technology for Directed I/O (VT-d) Intel(VT-x with Extended Page Tables (EPT) Intel® Identity Protection Technology	Intel® Speed Shift Technology Intel® Turbo Boost Technology Intel® Virtualization Technology (VT-x) Intel® 64 Enhanced Intel® SpeedStep® Technology Intel® Flex Memory Access Intel® Thermal Intel® Hyper-Threading Technology Intel® virtualization Technology for Directed I/O (VT-d) Intel(VT-x with Extended Page Tables (EPT) Intel® Identity Protection Technology
Security and Reliability	Intel® AES New Instructions Intel® OS Guard Intel® Memory Protection Extensions (Intel® MPX) Secure Key Execute Disable Bit Intel® Software Guard Extensions (Intel® SGX) Intel® Platform Trust Technology (Intel® PTT)	Intel® AES New Instructions Intel® OS Guard Intel® Memory Protection Extensions (Intel® MPX) Secure Key Execute Disable Bit Intel® Software Guard Extensions (Intel® SGX) Intel® Platform Trust Technology (Intel® PTT)
Operating System Features	Control Center Utility, Windows Hello Support, Voice Assistant Support for Alexa and Cortana	Control Center Utility, Windows Hello Support, Voice Assistant Support for Alexa and Cortana

1 – Acoustic performance will vary based on system placement, room size and background noise. Acoustic testing for the different operating modes was conducted using a simulated full work load.

2 – Battery life will vary based on system configuration and actual system usage. Battery life testing for the different operating modes was conducted by playing a locally stored H.264 1080p video, volume at 67% and backlight at 40%. Wireless was enabled, but not connected to a network. LAPQC71A configured with 8GB memory/256GB storage, LAPQC71B configured with 8GB memory/512GB storage.

## 2 Technical Reference

### 2.1 Block Diagram

Figure 1 is a block diagram of the major functional areas of LAPQC71A and LAPQC71B.

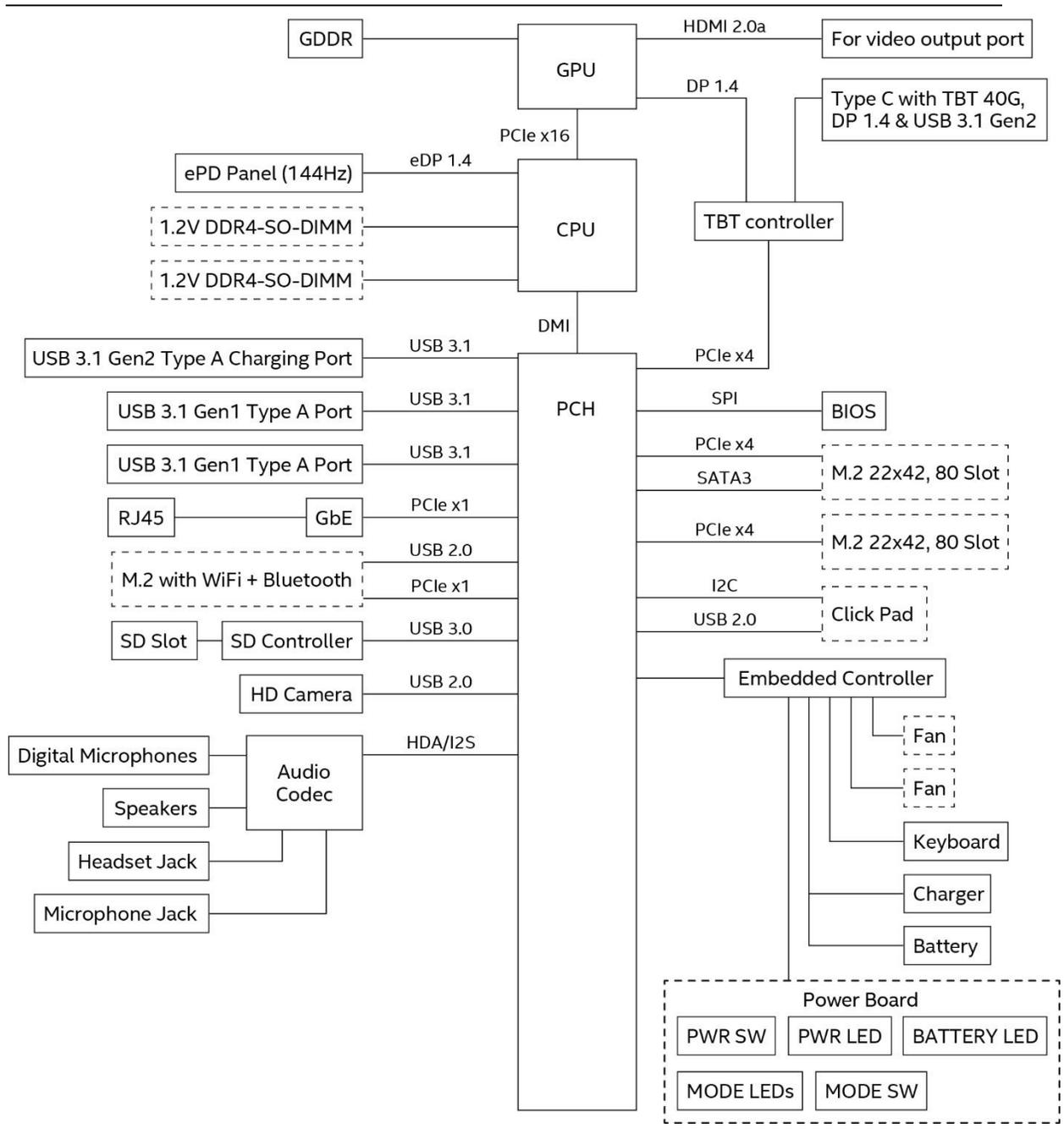


Figure 1. Block Diagram

## 2.2 LAPQC71A and LAPQC71B Exterior Features

The following figures show the exterior features of the LAPQC71A and LAPQC71B.

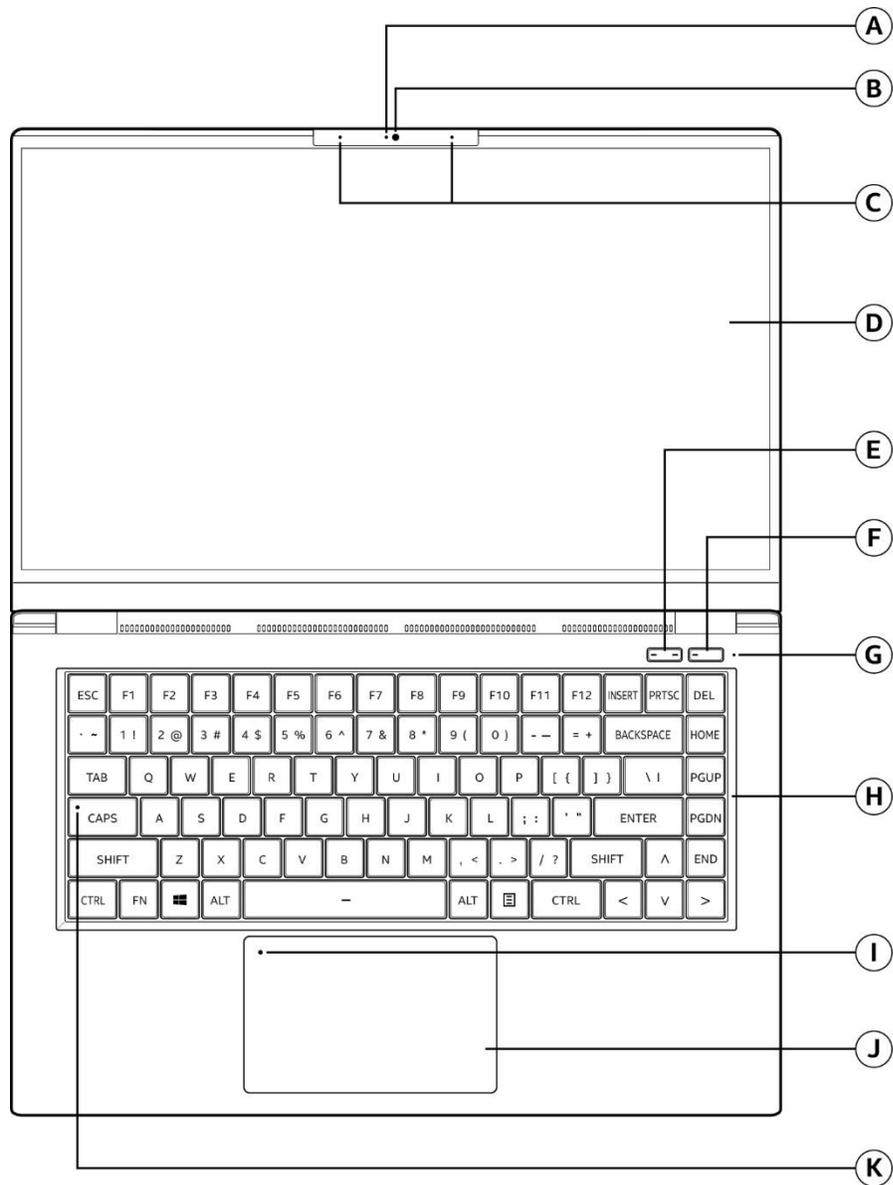


Figure 2. Top-Open Features

Table 3. Top-Open Features

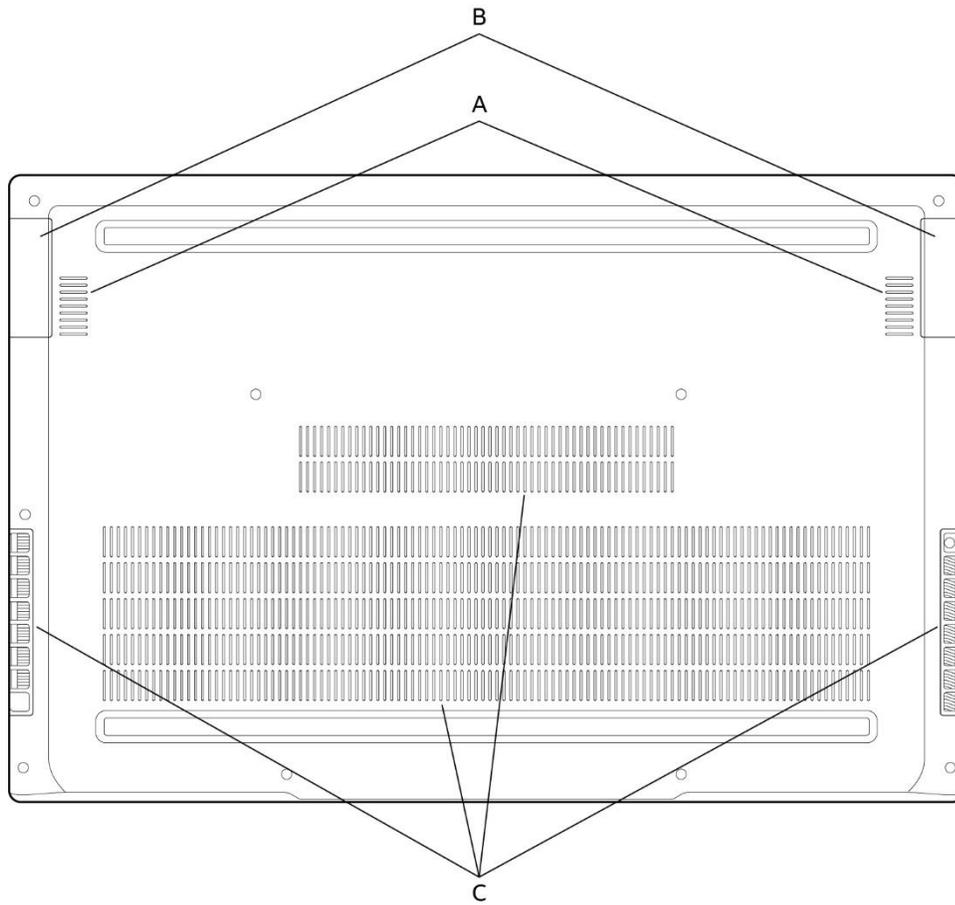
Feature	Description	Feature	Description	Feature	Description
A	Camera Status LED	F	Power Button with LED	K	Caps Lock Status LED
B	Camera	G	Battery Status LED		
C	Digital Microphones	H	Mechanical RGB Keyboard		
D	LCD Screen	I	Touchpad Switch/LED		
E	Mode Button with LEDs	J	Touchpad/Clickpad		



**Figure 3. Front Features**

**Table 4. Front Features**

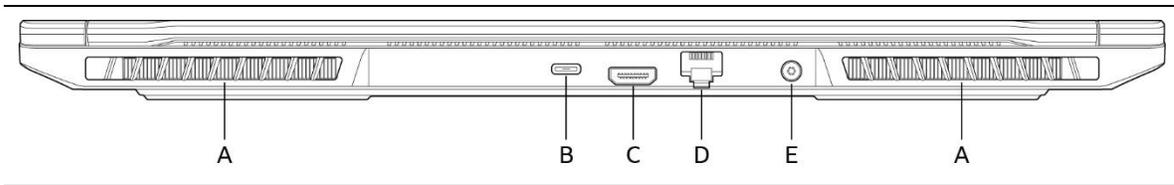
Letter	Feature
A	RGB Light Bar



**Figure 4. Bottom Features**

**Table 5. Bottom Features**

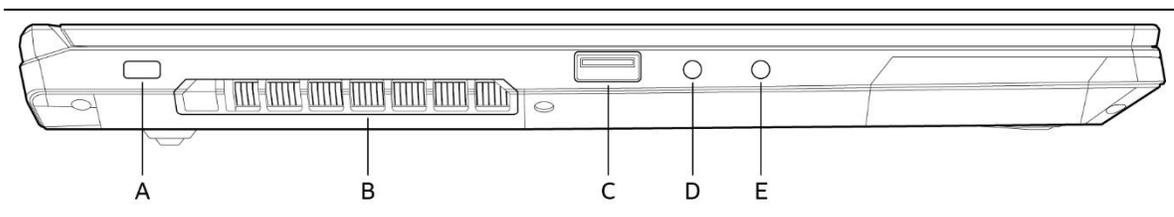
Feature	Description
A	Speakers
B	Antennas
C	Air Vents



**Figure 5. Back Features**

**Table 6. Back Features**

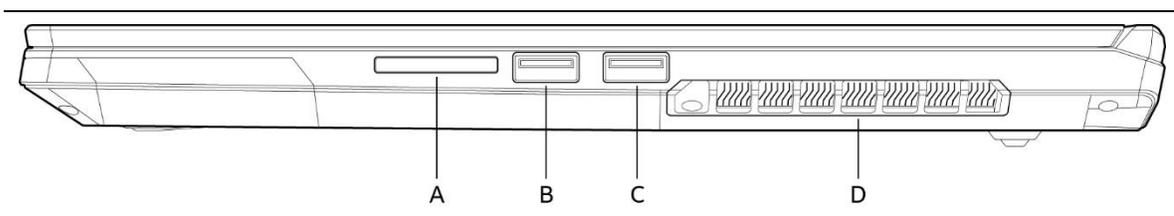
Feature	Description
A	Air Vents
B	Thunderbolt 3 Port (USB Type C with support for DisplayPort*)
C	HDMI Port
D	RJ-45 Network Jack
E	Power Connector



**Figure 6. Left Features**

**Table 7. Left Features**

Feature	Description
A	Kensington Security Lock
B	Air Vents
C	USB 3.1 (Gen 2) Type A (support for charging)
D	3.5mm Microphone Jack
E	3.5mm Headphone Jack



**Figure 7. Right Features**

**Table 8. Right Features**

Feature	Description
A	SD Card Slot (SD/SDHC/SDXC)
B	USB 3.1 (Gen 1) Type A
C	USB 3.1 (Gen 1) Type A
D	Air Vents

## 2.3 Back Cover Removal

The back cover of the laptop will need to be removed in order to access the SO-DIMM connectors, the M.2 connectors and the BIOS Security Jumper. See Figure 8 on how to remove the back cover.

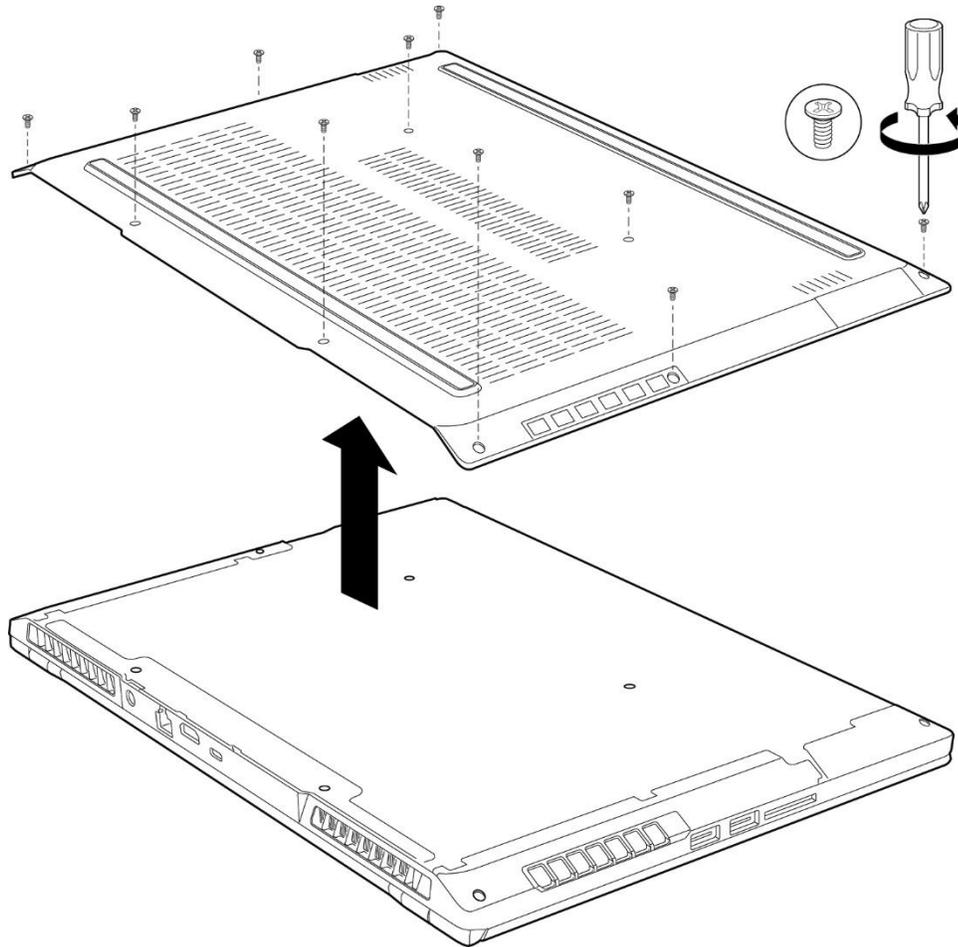


Figure 8. Back Cover Removal



### CAUTION

*Do not remove or replace the back cover with the power on. Always turn off the power and unplug the power cord from the system before removing or replacing the back cover. Otherwise, the system could be damaged.*

## 2.4 Memory

Two 260-pin SO-DIMM sockets support the following memory features:

- 1.2V DDR4 SDRAM SO-DIMMs with gold plated contacts
- Two independent memory channels with interleaved mode support
- Unbuffered, single-sided or double-sided SO-DIMMs
- 64 GB maximum total system memory
- Non-ECC SO-DIMMs
- Serial Presence Detect
- DDR4 2666 MHz SDRAM SO-DIMMs



### NOTE

To be fully compliant with all applicable DDR SDRAM memory specifications, the LAPQC71 should be populated with SO-DIMMs that support the Serial Presence Detect (SPD) data structure. This allows the BIOS to read the SPD data and program the chipset to accurately configure memory settings for optimum performance.

Table 9 lists the supported SO-DIMM configurations.

**Table 9. Supported DDR4/-RS Non-ECC SO-DIMM Module Configurations**

Raw Card Version	DIMM Capacity	DRAM Device Technology	DRAM Organization	# of DRAM Devices	# of Ranks	# of Row/Col Address Bits	# of Banks Inside DRAM	Page Size
A	4GB	4Gb	512M x 8	8	1	15/10	16	8K
A	8GB	8Gb	1024M x 8	8	1	16/10	16	8K
B	8GB	4Gb	512M x 8	16	2	15/10	16	8K
B	16GB	8Gb	1024M x 8	16	2	16/10	16	8K
C	2GB	4Gb	256M x 16	4	1	15/10	8	8K
C	4GB	8Gb	512M x 16	4	1	16/10	8	8K
E	8GB	4Gb	512M x 8	16	2	15/10	16	8K
E	16GB	8Gb	1024M x 8	16	2	16/10	16	8K
E	32GB	8Gb	2048M x 8	16	2	16/10	16	8K



### CAUTION

Do not add or remove memory with the power on. Always turn off the power and unplug the power cord from the system before adding or removing memory. Otherwise, the system could be damaged.

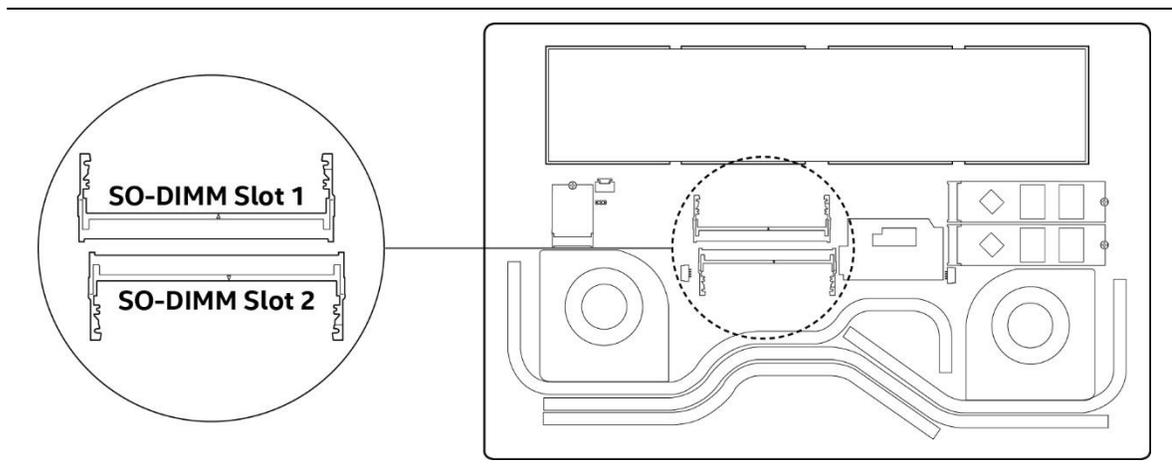


Figure 9. Location of the SO-DIMM Connectors

## 2.5 Storage

The following storage interface options are supported via two M.2 2280 (key type M) connectors:

- SATA 6.0 Gb/s ports are reserved for the M.2 storage modules supporting M.2 2280 (key type M) modules (Only supported on M.2 slot 1)
- Gen 3 PCIe X4 AHCI, NVMe ports are reserved for the M.2 storage modules supporting M.2 2280 (key type M) modules (supported on both M.2 slots)

### 2.5.1 AHCI Mode

LAPQC71 supports AHCI storage mode.



#### NOTE

*In order to use AHCI mode, AHCI must be enabled in the BIOS. Microsoft® Windows® 10 includes the necessary AHCI drivers without the need to install separate AHCI drivers during the operating system installation process; however, it is always good practice to update the AHCI drivers to the latest available by Intel.*

### 2.5.2 Intel® Rapid Storage Technology / SATA RAID

LAPQC71 supports Intel® Rapid Storage Technology, providing both AHCI and integrated RAID functionality. The RAID capability provides high-performance RAID 0 and 1 functionality on all PCIe NVMe M.2 drives. Other RAID features include hot spare support and SMART alerting. Software components include an Option ROM for pre-boot configuration and boot functionality, a Microsoft Windows compatible driver, and a user interface for configuration and management of the RAID capability.



#### NOTE

*In order to use supported RAID features, you must first enable RAID in the BIOS.*



**CAUTION**

Do not add or remove storage with the power on. Always turn off the power and unplug the power cord from the system before adding or removing storage. Otherwise, the system could be damaged.

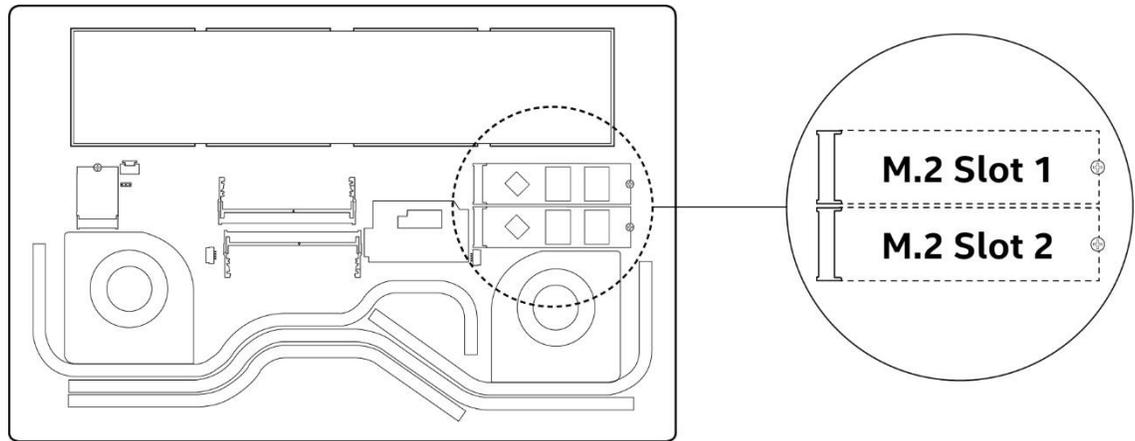


Figure 10. Location of the M.2 Connectors

## 2.6 BIOS Security Jumper



**CAUTION**

Do not change the jumper with the power on. Always turn off the power and unplug the power cord from the system before changing a jumper setting. Otherwise, the system could be damaged.

Figure 11 shows the location of the BIOS Security Jumper. The 3-position jumper determines the BIOS Security program's mode.

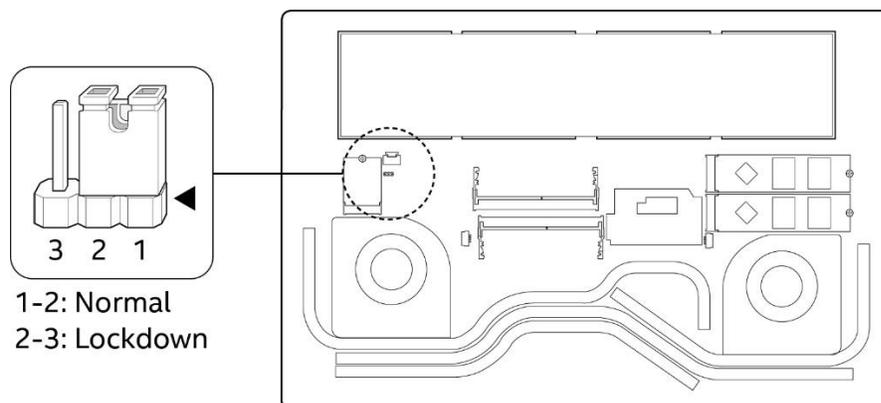


Figure 11. Location of the BIOS Security Switch

Table 10 describes the jumper settings for the three modes: normal, lockdown, and configuration.

**Table 10. BIOS Security Switch Settings**

Function/Mode	Switch Setting	Configuration
Normal	1-2	The BIOS uses current configuration information and passwords for booting.
Lockdown	2-3	<p>The BIOS uses current configuration information and passwords for booting, except:</p> <ul style="list-style-type: none"> <li>All POST Hotkeys are suppressed (prompts are not displayed and keys are not accepted. For example, F2 for Setup, F10 for the Boot Menu).</li> </ul> <p>BIOS updates are not available except for automatic Recovery due to flash corruption.</p>
Configuration	None	<p>BIOS Recovery Update process if \EFI\INTEL\QCCFL357.CAP file is found. Recovery Update can be cancelled by pressing the Esc key.</p> <p>If the Recovery Update was cancelled or \EFI\INTEL\QCCFL357.CAP file was not found, a Config Menu will be displayed. The Config Menu consists of the following options:</p> <p>[1] Suppress this menu until the BIOS Security Jumper is replaced.</p> <p>[2] Clear BIOS User and Supervisor Passwords.</p> <p>[3] Clear Trusted Platform Module Warning: Data encrypted with the TPM will no longer be accessible if the TPM is cleared</p> <p>[F2] BIOS Setup</p> <p>[F4] BIOS Recovery</p>

## 2.7 Environmental

Table 11 lists the environmental specifications for the LAPQC71A and LAPQC71B.

**Table 11. Environmental Specifications**

Parameter	Specification		
<b>Temperature</b>			
Non-Operating	-40 °C to +60 °C		
Operating	0 °C to +30 °C		
<b>Shock</b>			
Unpackaged	50 g trapezoidal waveform		
	Velocity change of 170 inches/s <sup>2</sup>		
Packaged	Half sine 2 millisecond		
	Product Weight (pounds)	Free Fall (inches)	Velocity Change (inches/s <sup>2</sup> )
	<20	36	167
	21-40	30	152
	41-80	24	136
	81-100	18	118
<b>Vibration</b>			
Unpackaged	5 Hz to 20 Hz: 0.01 g <sup>2</sup> Hz sloping up to 0.02 g <sup>2</sup> Hz		
	20 Hz to 500 Hz: 0.02 g <sup>2</sup> Hz (flat)		
Packaged	5 Hz to 40 Hz: 0.015 g <sup>2</sup> Hz (flat)		
	40 Hz to 500 Hz: 0.015 g <sup>2</sup> Hz sloping down to 0.00015 g <sup>2</sup> Hz		

**Note:** Before attempting to operate this product, the overall temperature of the product must be above the minimum operating temperature specified. It is recommended that the product temperature be at least room temperature before attempting to power on the product. The operating and non-operating environment must avoid condensing humidity.

**Warning!** To reduce the possibility of heat -related injuries or of overheating the computer, do not place the computer directly on your lap or obstruct the computer air vents. Use the computer only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to come into contact with the skin or a soft surface, such as pillows or rugs or clothing, during operation. The computer and the AC adapter comply with the user -accessible surface temperature limits defined by the International Standard for Safety of Information Technology Equipment (IEC 60950).

## **3 Characterized Errata**

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No known characterized errata at this time.