Dell Latitude 5424 Rugged

Owner's Manual

Regulatory Model: P85G
Regulatory Type: P85G001

Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your product.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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Contents

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Introduction

Product overview

The new Dell Latiude 5424 Rugged is next in line to the generation of Rugged Latitude 5000 series. This series delivers the highest levels of performance, newest technologies, high levels of configurability and premium industrial design to professionals that run industry specific applications as part of their daily field activities.

Dell Latiude 5424 Rugged is a versatile solution that packs the power and performance of a workstation into a class leading rugged form factor. It is a powerful notebook designed for highly mobile professionals who needs to run mission critical applications in the office, at the job site, at home or at the field. The Dell Latitude 5424 Rugged is the successor of Dell Latitude 5414.

The Dell Latitude 5424 Rugged is the most powerful and feature rich rugged notebook, that gives users desktop replacement performance in a mobile form factor. It will provide un-compromised performance for professionals that need to have fixed workstation performance in remote locations.

Features:

- Intel 6th, 7th and 8th generation core and i3, i5, i7 Processors.
- 2133 / 2400 MHz memory with Super Speed options
- Up to 3 storage devices
- New AMD graphics option
- USB Type-C port with Power Delivery
- Next generation wired docking
- ISV Certifications

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System information

This chapter provides detailed product specifications and the comparison with its predecessors.

Topics:

- Technical specifications
- Product Comparison

Technical specifications

NOTE: Offerings may vary by region. The following specifications are only those required by law to ship with your computer. For more information about the configuration of your computer, go to Help and Support in your Windows operating system and select the option to view information about your computer.

System information

Table 1. System information

Chipset	• Intel Kaby Lake U Dual Core (integrated with processor) • Intel Kaby Lake U Quad Core(integrated with processor) • Intel Sky Lake U Dual Core (integrated with processor)
DRAM bus width	64-bit
FLASH EPROM	SP1 128 Mbits
PCIe bus	100 Mhz
External bus frequency	DMI 3.0-8GT/s

Base

Table 2. Base configurations

Base
• Intel Dual-Core i3-7130U Kaby Lake processor, Intel HD 620 UMA graphics, TPM
• Intel Quad-Core i5-8350U Kaby Lake processor, Intel UHD 620 UMA graphics, TPM, vPro
• Intel Quad-Core i5-8350U Kaby Lake processor, AMD Radeon 540(2GB/64-Bit) Discreet graphics, TPM, vPro
• Intel Quad-Core i5-8350U Kaby Lake processor, AMD Radeon RX540(4GB/128-Bit) Discreet graphics, TPM, vPro
• Intel Quad-Core i7-8650U Kaby Lake processor, AMD Radeon 540(2GB/64-Bit) Discreet graphics, TPM, vPro
• Intel Quad-Core i7-8650U Kaby Lake processor, AMD Radeon RX540(4GB/128-Bit) Discreet graphics, TPM, vPro
• Intel Dual-Core i5-6300U Sky Lake processor, Intel HD 520 UMA graphics, TPM

Processor

NOTE: Processor numbers are not a measure of performance. Processor availability is subject to change and may vary by region/country.

Table 3. Processor specifications

Type	UMA Graphics
Intel Dual-Core i3-7130U Kaby Lake processor, Cache: 3 MB / # of Thread(T): 4 / Base Frequency : 2.7 GHz / Thermal Design Power (TDP): 15 W)	Intel HD Graphics 620
Intel Quad-Core i5-8350U Kaby Lake processor (6 MB / 8T / 1.7 GHz / 15 W)	Intel UHD Graphics 620
Intel Quad-Core i7-8650U Kaby Lake processor (8 MB / 8T / 1.9 GHz / 15 W)	Intel UHD Graphics 620
Intel Dual-Core i5-6300U Sky Lake processor (3MB / 4T / 2.4 Ghz / 15W	Intel HD Graphics 520

Memory

Table 4. Memory specifications

Minimum memory configuration	8 GB
Maximum memory configuration	32 GB
Number of slots	Two DDR4 SODIMM slots
Maximum memory supported per slot	16 GB
Memory options	• 8 GB - 2 x 4 GB • 16 GB - 2 x 8 GB • 32 GB - 2 x 16 GB
Type	DDR4 SDRAM (Non-ECC memory only)
Speed	• 2400 MHz Kayby Lake • 2133 MHz Sky Lake

System board connectors

Table 5. Internal M.2 System board connectors

M.2 (Socket 1, Key A)	Wireless Local Area Network (WLAN) / Wireless Gigabit Alliance (WiGig)
M.2 (Socket 3, Key M)	SATA / PCIe x 2 or x 4 SSD
M.2 (Socket 2, Key B)	SSD include capacity / Wireless Wide Area Network (WWAN)

Storage

Table 6. Storage specifications

Type	Form factor	Interface	Security option	Capacity
Primary Storage (HDD, SSD, FIPS, SED, Opal)	None / PCIe M.2 2280 (Tool-free removable dual-sided M.2 compatible carrier sled)	M.2 2280 SSD PCIe x4 SATA 3	FIPS, SED, Opal	• 128 GB • 256 GB • 512 GB • 1 TB • 2 TB • 256 GB / 512GB FIPS 140-2 compliant SED • 1TB OPAL SED
Secondary Storage/ Cache (SSD/HDD)	None / 2.5 inch SATA HDD / M.2 SATA 3 SSD (Tool-free removable storage)	M.2 SATA 3 / M.2 2280 PCIe x4	None	• 256 GB • 512 GB • 1 TB
Third Storage/Cache (Replaces ODD airbay)	None/ 2.5 inch SATA 3 HDD / M.2 2280 (M.2 PCIe/SATA SSD/HDD (Tool-free removable storage) / 9.5 mm ODD	M.2 SATA 3 / M.2 2280 PCIe x4/ SATA 3	None	• 256 GB • 512 GB • 1 TB • 8x DVD-ROM 9.5 mm Optical Drive • 8x DVD+/-RW 9.5 mm Optical Drive • 6x BD-RE 9.5 mm Optical Drive

NOTE: 2.5 inch SATA 3 HDD replaces ODD airbay as primary storage option with no SSD in the primary storage area.)

Media card-reader

Table 7. Media-card reader specifications

Type	One SD-card slot
Supported cards	• SD • SDHC • SDXC

External Ports and connectors

Table 8. External Ports and connectors

Expansion Slot	ExpressCard / PCMCIA
USB	• One USB 3.1 Gen 1 Type-A port with Power on/Wake-up support • Two USB 3.1 Gen 1 Type-A port • One USB 3.1 Gen 1 Type-C port with PowerShare
Security	Kensington T-Bar Slot
Docking port	• USB Type-C Monitor Stand/Dock • Latitude USB Type-C Dock • Dell Rugged Family Pogo Dock (backward compatible with Gen 2)
Audio	• Universal audio jack (Global Headset Jack + mic phone in + line in support) • No / Noise reduction dual array microphones
Video	• HDMI 2.0
Network adapter	One RJ-45 connector
Serial port	One legacy Serial RS-232 port
Rear Configurable IO Space	• Blank - no IO, blank bezel (FACTORY DEFAULT) • 2nd Gigabit RJ-45 + 2nd RS-232 • 2nd Gigabit RJ-45 + Fischer Rugged USB • 2nd Gigabit RJ-45 + VGA OUT • 2nd Gigabit RJ-45 + DisplayPort OUT (full-size)
SIM card reader	One micro SIM card reader

Audio

Table 9. Audio specifications

Controller	ACL3254
Type	Mono-channel
Speakers	One
Interface	• Universal Stereo headset/mic combo • Rugged quality speakers • Noise reducing array microphones
Internal speaker amplifier	2 W (RMS)

Display

Table 10. Display specifications

Type	Full HD Touch/Non-Touch
Screen size (Diagonal)	14 inch (16:9)
Screen technology	FHD (1920x1080)
Display	Non Touch / Touch (10 finger PCAP Glove/Water/Stylus capable)
Native resolution	1920x1080
High definition	Yes
Luminance	Standard Brightness (SB):220 NIT / Outdoor Viewable(OV) :1000 NIT
Height	173.95 mm / 6.85 (display area)
Width	309.4 mm / 12.18 inch
Megapixels	2.07
Pixels Per Inch (PPI)	157
Pixel pitch	0.161 mm
Color depth	16.2M colors (OV) / 262K (SB)
Contrast ratio (typical)	1500 (OV) / 700 (SB)
Response time (max)	35 ms

Refresh rate	60 Hhz
Horizontal viewing angle	85/85°
Vertical viewing angle	85/85°
Stylus support	Yes, Passive

Graphics Specifications

Table 11. Graphics specifications

Controller	Type	CPU Dependency	Graphics memory type	Capacity	External display support	Maximum resolution
Intel HD 620 Graphics	UMA	Intel Core i3 - 7130U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
Intel UHD 620 Graphics	UMA	Intel Core i5 - 8350U Intel Core i7 - 8650U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
Intel HD 520 Graphics	UMA	Intel Core i5-6300U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
AMD Radeon 540	Discreet	Intel Core i5 - 8350U Intel Core i7 - 8650U	Discreet	Dedicated, 2 GB DDR5	HDMI 2.0 Additional video ports via Rear Configurable IO Space • VGA • DisplayPort	4096×2304 @60 Hz
AMD Radeon RX540	Discrete	Intel Core i5 - 8350U Intel Core i7 - 8650U	Discreet	Dedicated, 4 GB DDR5	HDMI 2.0 Additional video ports via Rear Configurable IO Space • VGA • DisplayPort	4096×2304 @60 Hz

NOTE: Additional video ports via Rear Configurable IO Space is available with discreet graphics solution only.

Camera

Table 12. Camera specifications

Resolution	Camera: • Still image: 0.92 megapixels

	• Video: 1280x720 at 30 fps Infrared camera (optional): • Still image: 0.30 megapixels • Video: 340x340 at 60 fps
Diagonal viewing angle	• Camera - 86.7 degrees • Infrared camera - 70 degrees

Communication

Table 13. Communication specifications

Ethernet	Integrated Intel i219LM 10/100/1000 Mb/s Ethernet (RJ-45) with Intel Remote Wake UP, PXE and Jumbo frames support. (2nd NIC in rear configurable IO space)
Wireless LAN(Optional)	• Intel Dual Band Wireless AC 8265 (802.11ac) 2x2 + Bluetooth 4.1 • Intel Dual Band Wireless AC 8265 (802.11ac) 2x2 (No BT) • Dell Wireless 1820 - 802.11a/b/g/n/ac Dual Band (2x2) WiFi + Bluetooth 4.2
Wireless WAN(Optional)	Dell Wireless 5821E Qualcomm Snapdragon X20 LTE
Global Positioning System(GPS) Module (Optional)	U-blox NEO-M8 dedicated GPS card

Smart card reader

Table 14. Contactless smart card

Type	FIPS 201 Contacted / Contactless Smart Card reader
ISO certification	ISO14443A

Keyboard

Table 15. Keyboard specifications

Number of keys	• 83 keys: US English, Thai, French-Canadian, Korean, Russian, Hebrew, English-International • 84 keys: UK English, French Canadian Quebec, German, French, Spanish (Latin America), Nordic, Arabic, Canada Bilingual • 85 keys: Brazilian Portuguese • 87 keys: Japanese
Size	Six row keyboard • X= 19.05 mm key pitch

	• Y= 19.05 mm key pitch
Backlit keyboard	None / RGB Backlight / Rubberized Sealed
Layout	QWERTY / AZERTY / Kanji

Touchpad

Table 16. Touchpad specifications

Resolution	• Horizontal: 305 • Vertical: 305
Dimensions	• Width: 4.13 inch (105 mm) • Height: 2.36 inch (60 mm)
Multi-touch	Supports four - fingers multi-touch

Battery

Table 17. Battery Specifications

Type	• 3-cell 51 Whr (ExpressCharge) • 3-cell 51 Whr (Long-Life Cycle, includes 3 year limited warranty)
Dimension	• Length: 128.4 mm (5.05 inch) • Width: 86.3 mm (3.39 inch) • Height: 15.3 mm (0.60 inch)
Weight (maximum)	237.00 g (0.52 lb)
Voltage	51 WHr - 11.4 VDC
Life span	300 discharge/recharge cycles
Charging time when the computer is off (approximate)	4 hours
Operating time	Varies depending on operating conditions and can significantly reduce under certain power-intensive conditions
Temperature range: Operating	0°C to 60°C (32°F to 140°F)
Temperature range: Storage	-40°C to 70°C (-40°F to 158°F)
Coin-cell battery	3 V, CR2032, lithium ion

Power adapter

Table 18. Power adapter specifications

Type	• 19.5 V @ 130 W & 90 W adapters through 7.4 mm Normal and Elbow Barrel • USB Type-C with PD (Power Distribution) • Via Dock supporting a NVDC charger architecture
Input Voltage	100 VAC to 240 VAC
Input current (maximum)	• 90 W - 2.34 A • 130 W - 3.5 A
Adapter size	7.4 mm
Input frequency	50 Hz to 60 Hz
Output current	• 90 W - 9.23 A (continuous) • 130 W - 12.31 A (continuous)
Rated output voltage	19.5 VDC
Temperature range (Operating)	0º to 40º C (32º to 104º F)
Temperature range (Non-Operating)	40º to 70º C (-40º to 158º F)

Physical system dimensions

Table 19. Physical system dimensions

Chassis weight (pounds / kilograms)	5.5 / 2.5 (without handle and bumpers)

Table 20. Chassis dimensions

Height (inches / centimeters)	13.67 / 34.70
Width (inches / centimeters)	9.56 / 24.30
Depth (inches / centimeters)	1.77 / 4.49
Shipping weight (pounds / kilograms – includes packaging materials)	9.15 / 4.15

Table 21. Packaging parameters

Height (inches / centimeters)	43.5 / 17.12
Width (inches / centimeters)	7.6 / 3.0
Depth (inches / centimeters)	32.2 / 12.67

Computer environment

Airborne contaminant level: G1 as defined by ISA-S71.04-1985

Table 22. Computer environment

	Operating	Storage
Temperature range	-29°C to 60°C (-20.2°F to 140°F)	-51°C to 71°C (-59.8°F to 159.8°F)
Relative humidity (maximum)	10% to 80% (non-condensing) **NOTE: Maximum dew point temperature = 26°C**	10% to 95% (non-condensing) **NOTE: Maximum dew point temperature = 33°C**
Vibration (maximum)	0.26 GRMS	1.37 GRMS
Shock (maximum)	105 G †	40 G‡
Altitude (maximum)	-15.2 m to 3048 m (-50 ft to 10,000 ft)	-15.2 m to 10,668 m (-50 ft to 35,000 ft)

* Measured using a random vibration spectrum that simulates user environment.

† Measured using a 2 ms half-sine pulse when the hard drive is in use.

‡ Measured using a 2 ms half-sine pulse when the hard-drive head is in parked position.

Regulatory and Environmental Compliance

Table 23. Regulatory and Environmental Compliance specifications

- Energy Star Version 7¶
- EPEAT Silver Registered*
- TAA configurations available
- MIL 810G

* : For specific country participation and rating, please see www.epeat.net

¶ : Available on select configurations offered with single hard drive with both UMA and Discreet chipset.

Operating system

Table 24. Operating system

Operating systems supported	• Windows 10 Professional (64 bit) • Windows 10 Professional Enterprise • Windows 10 LTSB • Windows 7 via Dell CFI †

NOTE: † Supported on Intel Dual-Core i5-6300U SkyLake processor only.

Hardware and Software Security

Table 25. Hardware Security

Hardware Security	Available
TPM 2.0 FIPS 140-2 Certified, TCG Certified* * TCG certification (February 2018)	Yes, Discreet TPM 2.0 IC (Backward downgradable to 1.2)
BIOS disable TPM (China/Russia)	Yes
Optional Control Vault 2.0 Advanced Authentication with FIPS 140-2 level 3 certification (HW authentication configurations)	Yes, TCG Certified (February 2018)
Optional hardware authentication bundle 2: • FIPS 201 contacted smart card • Control Vault 2.0	Yes
Optional hardware authentication bundle 4: • Touch finger print reader • FIPS 201 contacted smart card • Contactless smart card • NFC • Control Vault 2.0	Yes • Synaptics Fingerprint reader • Synaptics Smart Card Reader + Contactless Smart Card
Security lock slot (Kensington T-Bar Lock Slot)	Yes
SED (Opal 2.0 - SATA Interface)	Yes
Statement of Non-Volatility	Yes
Bundle 6 Control Vault 2 and touch fingerprint	Yes
POA: Power On Authentication	Yes(Supported with Fingerprint reader only)

Table 26. Software Security

Software security	Available
Latitude Security software per software functional plan/cycle list	Yes
D-Pedigree for BIOS (Secure Supply Chain Functionality) provides:	Yes

- Secure Supply Chain for a Product covers BIOS Image Integrity
- Chain of Custody
- Part Traceability

Product Comparison

Table 27. Product comparison with predecessor model

	Latitude 5414	Latiude 5424 Rugged
Processor	• 6th Generation Intel Sky Lake (15 W) Dual Core i3/i5/i7	• 6th Generation Intel Sky Lake (15 W) Dual Core i5 • 7th Generation Intel Kaby Lake U (15 W) Quad Core i5/i7, Dual Core i3 • 8th Generation Intel Kaby Lake U (15 W) Quad Core i5/i7
Chipset	Intel CM238 chipset (H Quad Core)	Intel Kaby Lake / Sky Lake (integrated with the processor)
Memory	DDR4 2133 MHz; 2 SoDIMM slots supporting up to 32 GB (U Dual Core)	• DDR4 2133 MHz; 2 SoDIMM slots supporting up to 32 GB (SkyLake U) • DDR4 2400 MHz; 2 SoDIMM slots supporting up to 32 GB (KabyLake U)
Storage	• None • 2.5" HDD: Up to 1 TB, hybrid, OPAL SED options • SSD M.2 2280 SATA: Up to 512 GB, OPAL SED options • 5.25" ODD (Optional)	• SSD M.2 2280 PCIe: Up to 1 TB, FIPS, OPAL, SED options • SSD M.2 2280 SATA: Up to1 TB, FIPS, OPAL, SED options • 5.25" ODD (Optional, can be used as third drive) • 2.5" HDD: Up to 1 TB, hybrid, OPAL SED options
Graphics	**Integrated** Intel HD 520 Graphics (Integrated in Intel 6th generation processors OR Radeon R7 M360 (Discreet)	**Integrated** • Intel HD Graphics 620 (Integrated in Intel 7th generation processors) • Intel UHD Graphics 620 (Integrated in Intel 8th generation processors) • Intel HD 520 Graphics (Integrated in Intel 6th generation processors) **Discrete** • AMD Radeon 540, 2 GB GDDR5 • AMD Radeon RX540, 4 GB GDDR5
Audio	Realtek ALC3235 Controller	Waves MaxxAudio 7.5
Communication	• Integrated Intel i219 10/100/1000 Mb/s Ethernet • Wi-Fi 802.11a/b/g/n/ac with Bluetooth 4.2 • WWAN 4G LTE Full Mini Card (optional) • Optional dedicated u-blox NEO-M8 GPS card	• Integrated Intel i219 10/100/1000 Mb/s Ethernet • Wi-Fi 802.11a/b/g/n/ac with Bluetooth 4.2 • WWAN 4G LTE Full Mini Card (optional) • Bluetooth 4.2

	Latitude 5414	Latiude 5424 Rugged
		• Optional dedicated u-blox NEO-M8 GPS card
I/O connectors	• Three USB 3.0 ports(One with PowerShare) • One USB 2.0 • HDMI 1.4 • VGA Port • Two RJ-45 NIC ports • Two RS-232 Serial ports • One microphone/stereo headphone/ speakers connector • one micro-SIM slot with security feature	• Four USB 3.1 Gen 1 ports (One with PowerShare and Power on/Wake-up support) • HDMI 2.0 (Discrete) • One USB Type-C port(Supports charging) • Universal audio jack (Global Headset Jack + mic phone in + line in support) • RJ-45 connector • Serial RS-232 port Rear I/O space can be configured with RJ-45 along with following options: • Blank - no IO, blank bezel (FACTORY DEFAULT) • Serial RS-232 • VGA or • DisplayPort
Operating system	• Windows 10 Pro 64 bit • Windows 10 Home 64 bit	• Windows 10 Pro 64 bit • Windows 10 Home 64 bit • Windows 10 LTSB
BIOS	UEFI BIOS	UEFI BIOS
AC adapter	• 65 W adapter, 7.4 mm barrel • 65 W BFR/PVC halogen free adapter, 7.4 mm barrel • 90 W adapter, 7.4 mm barrel	• 19.5 V @ 60 W & 90 W adapters through 7.4 mm DC-IN jack • USB Type-C with PD
Battery	• 6 Cell 65 Whr • 9 Cell 91 Whr	• 3 Cell 51 Whr ExpressCharge capable battery • 3 Cell 51 Whr Battery (Long-Life Cycle)
Weight (Pounds/Kilogram)	7.8 / 3.54	5.5 / 2.5 (without handle and bumpers)

3

Chassis Overview

This chapter illustrates the multiple chassis views along with the ports and connectors called out.

Topics:

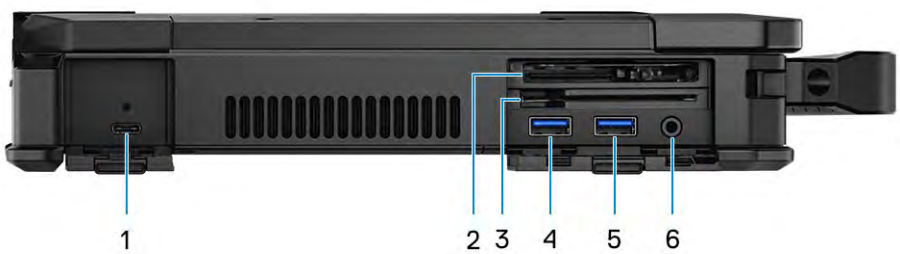
Top view

1	Power button	2	Keyboard
3	Touchpad	4	Fingerprint reader (optional)

Front View

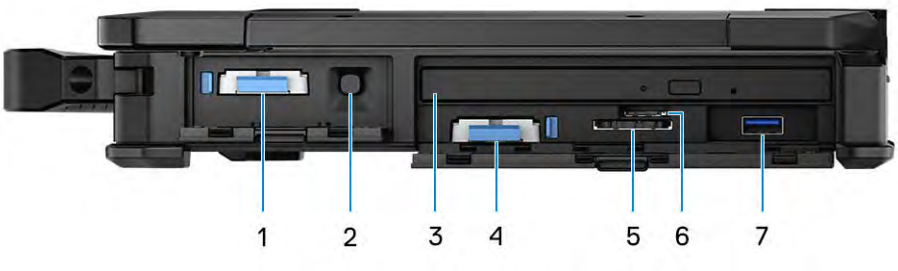
1	Camera Shutter	2	RGB Camera
3	RGB Camera status LED	4	IR Camera
5	IR Emitter	6	IR Camera status LED
7	Handle	8	Speakers
9	LCD Latch	10	Microphone array
11	Battery Status LED		

Left Side View



1	USB 3.0 Type-C Port with PD	2	ExpressCard reader/PCMCIA (optional)
3	Smart Card Reader	4	USB 3.0 Type-A Port(With PowerShare)
5	USB 3.0 Type-A Port	6	3.5 mm Universal audio port

Right Side View



1	Secondary SSD	2	Stylus garage
3	Optical Drive	4	Primary SSD
5	SD Card Reader	6	SIM Card Slot
7	USB 3.0 Type-A Port (recessed USB, supports mini USB connection with doors shut)		

Back View

1 RJ-45 Port (Optional Rear configurable I/O)

2 VGA Port (Optional Rear configurable I/O)

3 Serial Port

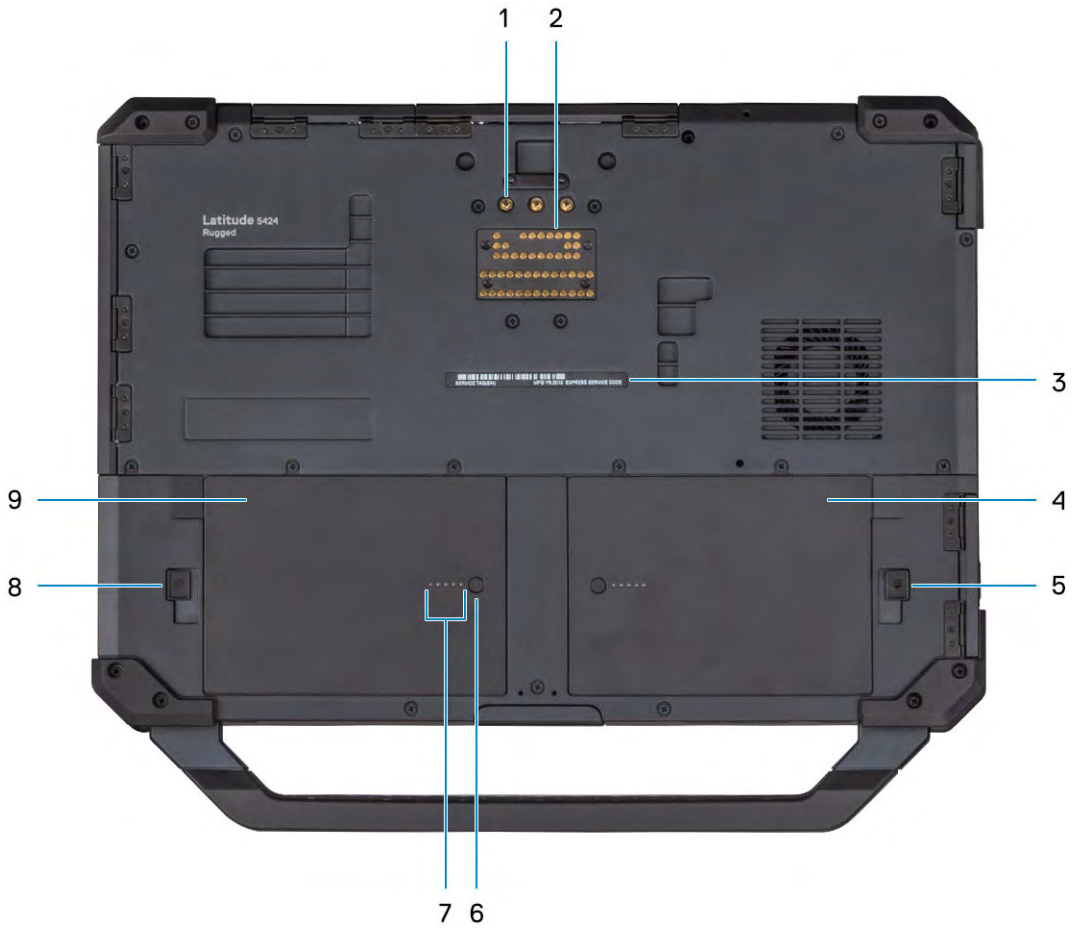
4 Ethernet Port

5 HDMI 2.0 Port

6 Kensington Lock Slot

7 DC-In(Power) Port

Bottom View



1	Radio frequency pass-through connectors	2	Docking port
3	Service tag sticker	4	Battery -1
5	Battery -1 Latch	6	Battery charge indicator button
7	Battery charge indicator LED	8	Battery -2 Latch
9	Battery -2 (Optional)		

4

Technology and components

This chapter details the technology and components available in the system.

Topics:

Using your computer

Stealth mode

Latitude rugged products come equipped with a stealth mode feature. Stealth mode allows you to turn off the display, all the LED lights, internal speakers, the fan and all wireless radios with a single key combination.

NOTE: This mode is aimed at using the computer in covert operations. When the stealth mode is enabled, the computer remains functional but does not emit any light or sound.

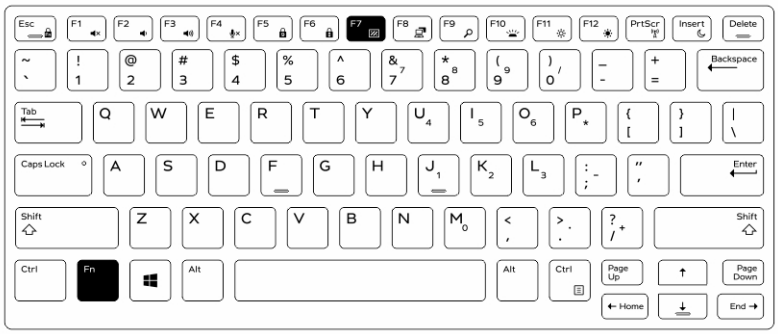
Turning stealth mode on/off

1 Press the Fn+F7 key combination (Fn key not needed if Fn lock is enabled) to turn on stealth mode.

NOTE: Stealth mode is a secondary function of the F7 key. The key can be used to perform other functions on the computer when not used with the Fn key to enable stealth mode.

2 All the lights and sounds are turned off.

3 Press the Fn+F7 key combination again to turn off the stealth mode.



Disabling stealth mode in the system setup (BIOS)

1 Power off the computer.

2 Power on the computer and at the Dell logo, tap the F2 key repeatedly to bring up the **System Setup** menu.

3 Expand and open the **System Configuration** menu.

4 Select **Stealth Mode Control**.

NOTE: Stealth mode is enabled by default.

5 To disable stealth mode uncheck the **Enable Stealth Mode** option.

6 Click **Apply changes** and click **Exit**.

Using the backlit keyboard

The Latitude rugged series comes equipped with a backlit keyboard that can be customized. The following colors are enabled:

1 White

2 Red

3 Green

4 Blue

Alternatively, the system can be configured with two additional custom colors in the System Setup (BIOS).

Turning the keyboard backlight on/off or adjusting brightness

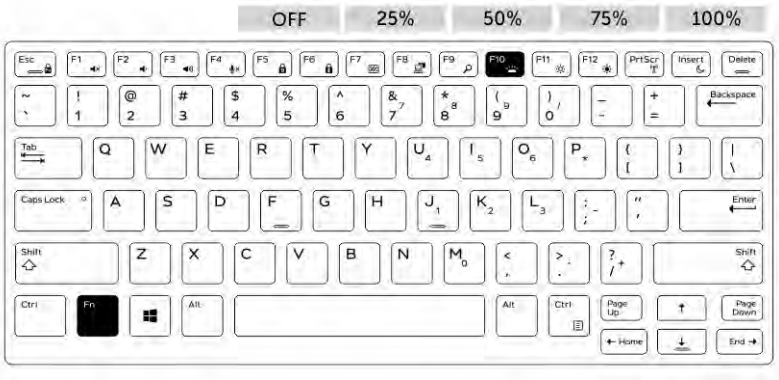
To turn the backlight on/off or adjust the backlight brightness settings:

1 To initialize the keyboard backlight switch, press Fn+F10 (the Fn key is not needed if function key Fn lock is enabled).

2 The first use of the preceding key combination turns on the backlight to its lowest setting.

3 Repeated pressing of the key combinations cycles the brightness settings through 25 percent, 50 percent, 75 percent and 100 percent.

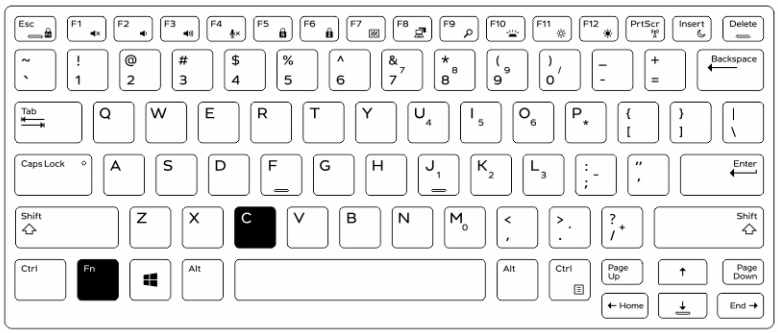
4 Cycle through the key combination to either adjust the brightness or turn off the keyboard backlight.



Changing the keyboard backlight color

To change the keyboard backlight color:

1 To cycle through the available backlight colors press Fn+C keys .
2 White, Red, Green and Blue are active by default; up to two custom colors can be added to the cycle in the System Setup (BIOS).



Customizing the backlit keyboard in System Setup (BIOS)

1 Turn off the computer.
2 Turn on the computer and when the Dell logo appears, press the F2 key repeatedly to bring up the System Setup menu.
3 Under **System Configuration** menu, select **RGB Keyboard Backlight**.
You can enable/disable the standard colors (White, Red, Green and Blue).
4 To set a custom RGB value, use the input boxes on the right side of the screen.
5 Click **Apply changes** and click **Exit** to close System Setup.

Function Fn key lock features

NOTE: The keyboard has Function key Fn lock capability. When activated, the secondary functions on the top row of keys become default and will not require use of the Fn key.

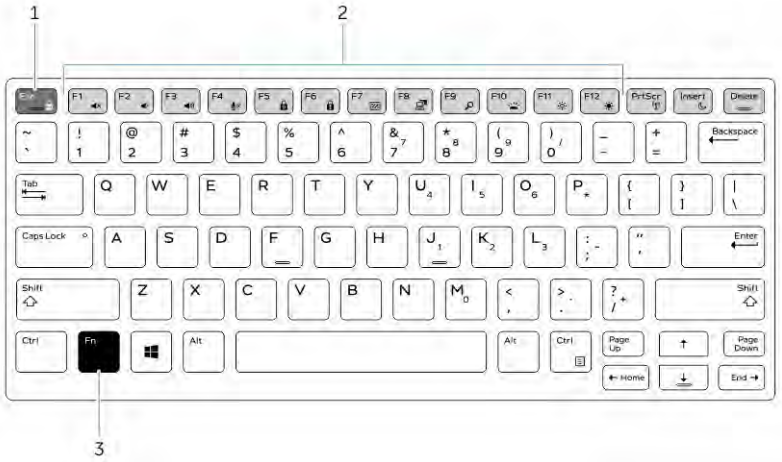


Figure 1. Fn key callouts

1 Fn lock key
2 Affected Fn keys
3 Fn key

NOTE: Fn lock affects only the above keys (F1 to F12). Secondary functions will not require the Fn key to be pressed while enabled.

Enabling the Function (Fn) lock

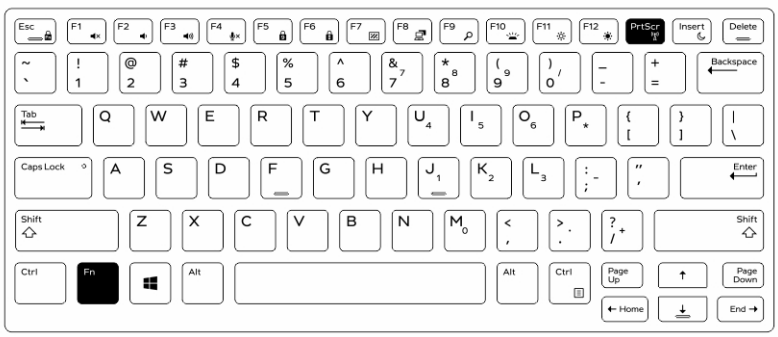
1 Press the Fn+Esc keys.

NOTE: Other secondary function keys on the top row are not affected and requires the use of the Fn key.

2 Press the Fn+Esc keys again to deactivate the function lock feature.
The function keys return to the default actions.

Enabling and disabling the wireless (WiFi) feature

1 To enable wireless Networking, press Fn + PrtScr.
2 Press Fn + PrtScr again to disable wireless Networking.



Hot key definition

Fn behavior: Primary behavior is media key; Secondary behavior is F1-F12 key.

- Fn Lock only switches primary and secondary behavior on F1-F12.

- F7 is stealth –unique for rugged and semi rugged platforms. It turns off LCD, all wireless, all alerts, indicator lights, sound, fan, etc

Table 28. Keyboard shortcuts

Hot keys	Function	Description
Fn+ESC	Fn Lock	Allows the user to toggle between **locked** and **unlocked** Fn keys.
Fn+F1	Audio Volume Mute	Temporarily mutes/unmutes the audio. The audio level before muting is returned after unmuting.
Fn+F2	Audio Volume Down/Decrease	Decreases the audio volume until minimum/off is reached.
Fn+F3	Audio Volume Up/Increase	Increases the audio volume until maximum is reached.
Fn+F4	Microphone Mute	Silences the on-board microphone so it cannot record audio. There is an LED on the F4 function key that notifies the user of the state of this feature: • LED off = microphone capable of recording audio • LED on = microphone muted and unable to record audio
Fn+F5	Num lock	Allows the user to toggle between **locked** and **unlocked** NumLock
Fn+F6	Scroll lock	Used as Scroll Lock key.
Fn+F7	Stealth Mode	Allows the user to toggle to and from Stealth Mode
Fn+F8	LCD and Projector display	Determines video output to LCD and external Video devices when attached and displays present.
Fn+F9	Search	Mimics the Windows key + F keystroke to open Windows Search dialog box.
Fn+F10	KB Illumination/Backlight	Determines the Keyboard Illumination/Backlight brightness level. The hot key cycles through the following brightness states when pressed: Disabled, Dim, Bright. For more detail, see Keyboard Illumination/Backlight section.
Fn+F11	Brightness Decrease	Decreases the stepping of LCD brightness for each press until minimum is reached. For details, see the LCD Brightness section.
Fn+F12	Brightness Increase	Increases the stepping of LCD brightness for each press until maximum is reached. For details, see the LCD Brightness section.

Hot keys	Function	Description
Fn+PrintScreen	Radio On/Off	Toggles all the radios on and off. For example, WLAN, WWAN, and Bluetooth.
Fn+Insert	Sleep	Puts the system into the ACPI S3 State and does not wake the system.

Traditional programming functions like Scroll Lock are assigned to alpha keys with un-printed legends.

- **Fn+S** = Scroll Lock
- **Fn+B** = Pause
- **Fn+Ctrl+B** = Break
- **Fn+R** = SysReq

NOTE: Non-backlit keyboards would not print the backlit icon on F10.

Chipsets

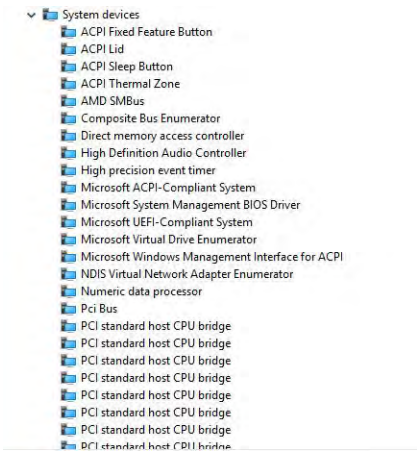
All laptops or notebook communicate with the CPU through the chipset. This laptop is shipped with the Intel Mobile CM238 .

Identifying the chipset in Device Manager on Windows 10

1 Click **All Settings** on the Windows 10 Charms Bar.
2 From the **Control Panel**, select **Device Manager**.
3 Expand **System Devices** and search for the chipset.

Identifying chipset in Device Manager on Windows 7

1 Click **Start → Control Panel → Device Manager**.
2 Expand **System Devices** and search for the chipset.



Intel chipset drivers

Verify if the Intel chipset drivers are already installed in the laptop.

Table 29. Intel chipset drivers

Before installation	After installation
	

Downloading the chipset driver

1 Turn on the computer.
2 Go to **Dell.com/support**.
3 Click **Product Support**, enter the Service Tag of your computer, and then click **Submit**.

NOTE: If you do not have the Service Tag, use the autodetect feature or manually browse for your computer model.

4 Click **Drivers and Downloads**.
5 Select the operating system installed in your computer.
6 Scroll down the page, expand **Chipset**, and select your chipset driver.
7 Click **Download File** to download the latest version of the chipset driver for your computer.
8 After the download is complete, navigate to the folder where you saved the driver file.
9 Double-click the chipset driver file icon and follow the instructions on the screen.

Trusted Platform Module

Trusted Platform Module (TPM) is a dedicated cryptoprocessor designed to secure hardware by integrating cryptographic keys into devices. A software can use a Trusted Platform Module to authenticate hardware devices. As each TPM chip has a unique and secret RSA key burned in as it is produced, it can perform the platform authentication.

NOTE: Trusted Platform Module (TPM) is part of the system board. In an event of system board replacement, the encryption needs to be suspended in the OS and re-enabled on new system board's BIOS prior to resuming the encryption.

CAUTION: Attempt to replace the system board without prior suspending the encryption, will cause operating system corruption and may eventually lead to No-Boot scenario.

Processors

This laptop is shipped with the following Intel 6th generation i5 SkyLake or 7th and 8th Generation KabyLake processors:

- Intel Core i3, 7130U KabyLake processor
- Intel Core i5, 8350U KabyLake or 6300U SkyLake processors
- Intel Core i7, 8650U KabyLake processor series

NOTE: The clock speed and performance varies depending on the workload and other variables.

Skylake processor

Intel Skylake is the successor to the Intel® Broadwell processor. It is a microarchitecture redesign using an already existing process technology and it will be branded as Intel 6th Gen Core. Like Broadwell, Skylake is available in four variants with suffixes SKL-Y, SKL-H, and SKL-U.

The Skylake also includes Core i7, i5, i3, Pentium and Celeron processors.

Skylake vs Broadwell roadmap

The following illustration is a roadmap comparison between the Skylake processor vs the Broadwell processor:

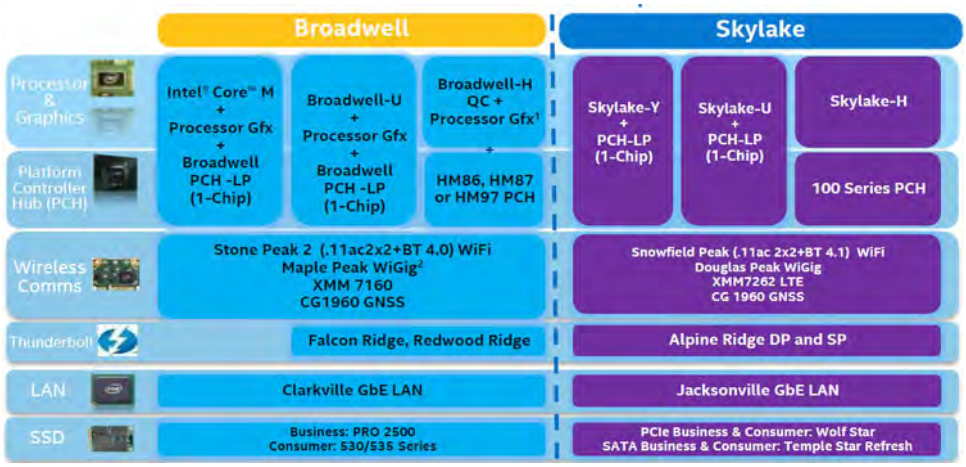


Figure 2. Skylake vs Broadwell roadmap

Processor performance features

The following table illustrates the performance available on each Skylake suffix.

Table 30. Performance features

Feature	Feature description	SKL-Y	SKL-U	SKL-H
General Features	Cores	Dual Core	Dual Core	Dual Core
	CPU/Memory/Graphic Overclocking	No	No	Yes
	Intel Extreme Tuning Utility	No	No	Yes
	Intel Hyper-Threading Technology	Yes	Yes	Yes
	Intel Smart Cache Technology with last level cache (LLC) sharing between Processor and GFx cores	Yes	Yes	Yes
	Intel Smart Sound Technology	Yes	Yes	Yes
	Intel Turbo Boost Technology 2.0	Yes	Yes	Yes
	Last Level Cache (LLC)	Up to 4M	Up to 4M	Up to 4M
	Voltage Optimizer	Yes	TBD	TBD
Display	3 Independent Display Support	Yes	Yes	Yes
	HDMI 2.0 Display @60Hz	3840x2160	3840x2160	3840x2160
	DP/eDP Display @60Hz	3840x2160	4096x2304	4096x2304
	eDP 1.3, support for MPO, NV12	Yes	Yes	Yes
Media	Intel Built-In Visuals	Yes	Yes	Yes
Compute	OpenCL 2.0	Yes	No	yes
Platform Hardware	14nm process	Yes	Yes	Yes
	16PCIe Graphic lanes (configurable as 1x16 or 2x8 or 1x8+2x4)	No	No	Yes
	PCIe Gen3.0 support	No	No	Yes
	Switchable graphics (muxless solution)	No	Yes	Yes
Memory	Memory Type	DDR4	DDR4	DDR4
	Connector / Memory Down	Memory down	SODIMM	SODIMM
	Speed	2133MT/s for DDR4	2133MT/s for DDR4	2133MT/s for DDR4
	Max Capacity	32 GB	32 GB	32 GB
OS Support	Windows 10 (64-bit)	Yes	Yes	Yes

Feature	Feature description	SKL-Y	SKL-U	SKL-H
	Windows 7 (64-bit / 32bit)	Yes	Yes	Yes
	Windows 8.1 (64-bit)	Yes	Yes	Yes
	Linux (kernel and associated modules)	Yes	Yes	Yes
	Chrome	Yes	Yes	No
	Android	No	No	No

General comparison with Broadwell processor

	Broadwell Platform Features	Skylake Platform Features
Performance	Improved CPU & Graphics performance (upto 50%) with significant power reduction (upto 40% lower SOC power) and longer battery life[1]	Improved CPU & Graphics performance (upto 50%) with significant power reduction (upto 60% lower SOC power) and longer battery life[1]
Thermals	H: 47W[2], U: 28W[2], U: 15W[2], Y: 4.5W[2] TDP Configurable TDP[3], Low Power Mode[3]	H: 45W[2] and 35W, U: 28W[2], U: 15W[2], Y: 4.5W[2] TDP Configurable TDP[3], Low Power Mode[3]
Graphics	Gen8, DX11.1, Open CL 1.2/2.0[3,4], Open GL 4.x, PCIe3.0	Gen9 LP, DX11.3, DX12, Open CL 1.2/2.0[3,4], Open GL 4.3/4.4, PCIe3.0
Media	Faster AVC and MPEG-2 with full HW encode; VP8 Encode (GPU), VP8 Decode, VP9 Decode (GPU), HEVC Decode; Intel® Quick Sync Video; 3 simultaneous Displays,	VP8 Encode, VP8 Decode, VP9 Decode (GPU), VP9 Encode (GPU), HEVC 8b Decode; HEVC 8b Encode, VDENC, SFC Intel® Quick Sync Video; 3 simultaneous Displays
Audio	Intel® Smart Sound Technology[3]	Enhanced Intel® Smart Sound Technology: GMM HW accelerated Speech, Enhanced Audio Pre and Post Processing, Enhanced Intel® Wake on Voice
2D Camera Imaging	Discrete ISP in camera module	Integrated ISP[U,Y], supporting upto 16MP, 4K@30fps, 1080p@60fps
RealSense 3D Cameras	Intel® RealSense F200 (UF Camera)	Intel® RealSense R200 (WF camera)[3], Intel® RealSense F200 (UF Camera)
I/O & Storage	USB 3.0[3], Thunderbolt™ Technology[6]	PCIe Gen3.0 (U and Y), eMMC5.0[3], SDXC3.0, USB OTG[10], CSI2 MIPI, USB 3.0[3], Thunderbolt™ Technology[6]
Touch and Sensing	Discrete Touch, Discrete Sensor Hub controllers on platform	Integrated Touch[8] processing,, Intel® Integrated Sensor Solution
Wireless	High Bandwidth 802.11 ac, WiGig[4] Cat4 LTE, Intel® Wireless Display 5.0[3], GNSS, NFC	High Bandwidth 802.11 ac, WiGig[4], Cat6 LTE, Intel® Wireless Display 6.0[3] Wireless Charging, GNSS, NFC
Security	McAfee YAP, Boot Guard, Intel® PTT 2.0[3], Intel® IPT[3], Intel® BIOS Guard v2.0[3], Anti-malware Boost (Beacon Pass 2.0)[7]	McAfee YAP w/ Intel® SGX, IPT with MFA Boot Guard, Intel® PTT 3.0[3],Intel® IPT[3], Intel® BIOS Guard v2.0[3]
Enterprise/SMB	Intel® vPro™ Technology w/ AMT 10.0, Intel® Small Business Advantage 3.0, Intel® vPro™ w/ Windows* 8.1 InstantGo*, Intel® Pro WiDi 5.1	Intel® vPro™ Technology w/ AMT 11.0, Small Business Advantage SBA Next Intel® Pro WiDi 6.0, Secure LBS

Figure 3. Comparison with Broadwell processor

Kaby Lake — 7th and 8th Generation Intel Core processors

The 7th and 8th Gen Intel Core processor (Kaby Lake) family is the successor of Sky Lake R. It's main features include:

- Intel 14nm Manufacturing Process Technology
- Intel Turbo Boost Technology
- Intel Hyper Threading Technology
- Intel Built-in Visuals
  - Intel HD graphics - exceptional videos, editing smallest details in the videos
  - Intel Quick Sync Video - excellent video conferencing capability, quick video editing and authoring
  - Intel Clear Video HD - visual quality and color fidelity enhancements for HD playback and immersing web browsing
- Integrated memory controller
- Intel Smart Cache
- Optional Intel vPro technology (on i5/i7) with Active Management Technology 11.6
- Intel Rapid Storage Technology

Table 31. Kaby lake specifications

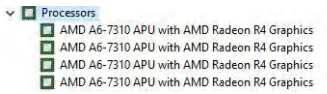
Processor number	Base Clock Speed	Cache	No. of cores/No. of threads	Power	Memory type	Graphics
Intel Dual Core i3-7130U	2.7 GHz	3 MB	2/4	15 W	DDR4-2400	Intel HD graphics 620
Intel Quad Core i5-8350U	1.7 GHz	6 MB	4/8	15 W	DDR4-2400	Intel UHD graphics 620
Intel Quad-Core i7-8650U	1.9 GHz	8 MB	4/8	15 W	DDR4-2400	Intel UHD graphics 620

Identifying processors in Windows 10

1 Tap **Search the Web and Windows**.
2 Type `Device Manager`.
3 Tap **Processor**.
The basic information of the processor is displayed.

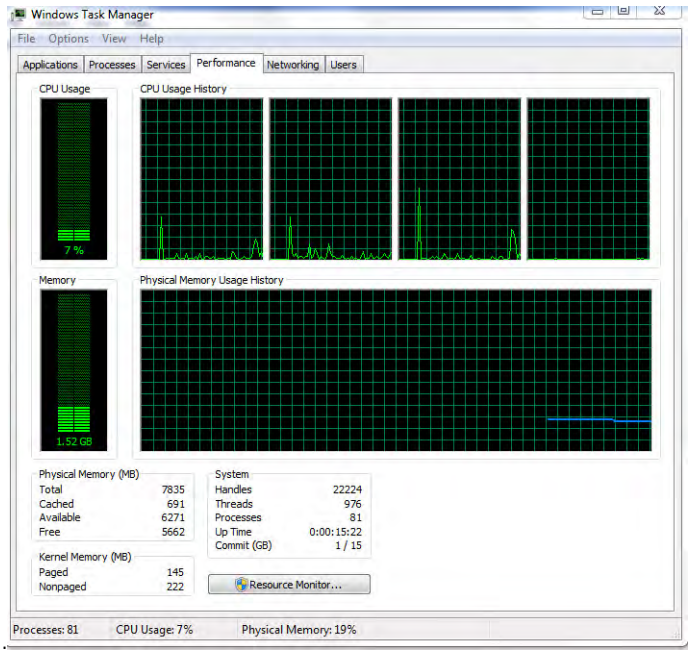
Identifying processors in Windows 7

1 Click **Start** > **Control Panel** > **Device Manager**.
2 Select **Processor**.
The basic information of the processor is displayed.



Verifying the processor usage in Task Manager

1 Press and hold the taskbar.
2 Select **Start Task Manager**.
The **Windows Task Manager** window is displayed.
3 Click the **Performance** tab in the **Windows Task Manager** window.



The processor performance details are displayed.

Verifying the processor usage in Resource Monitor

1 Press and hold the taskbar.

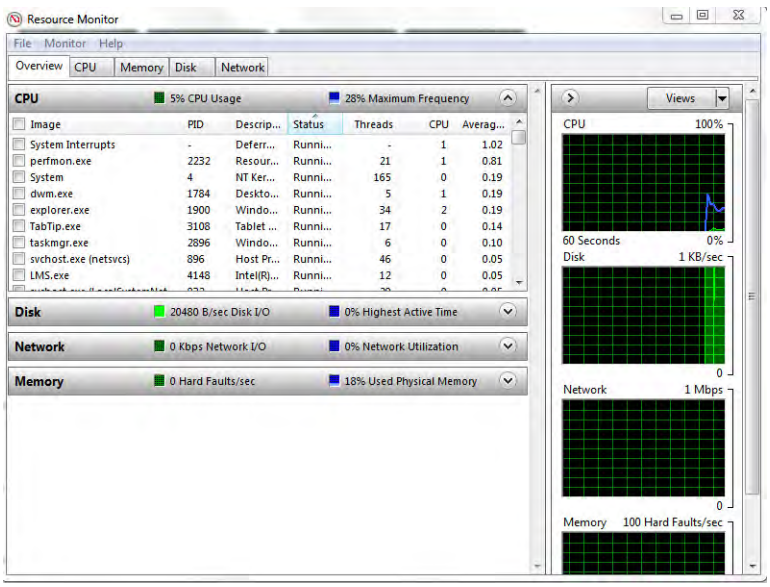
2 Select **Start Task Manager**.

The **Windows Task Manager** window is displayed.

3 Click the **Performance** tab in the **Windows Task Manager** window.

The processor performance details are displayed.

4 Click **Open Resource Monitor**.



DDR4

DDR4 (double data rate fourth generation) memory is a higher-speed successor to the DDR2 and DDR3 technologies and allows up to 512 GB in capacity, compared to the DDR3's maximum of 128 GB per DIMM. DDR4 synchronous dynamic random-access memory is keyed differently from both SDRAM and DDR to prevent the user from installing the wrong type of memory into the system.

DDR4 needs 20 percent less or just 1.2 volts, compared to DDR3 which requires 1.5 volts of electrical power to operate. DDR4 also supports a new, deep power-down mode that allows the host device to go into standby without needing to refresh its memory. Deep power-down mode is expected to reduce standby power consumption by 40 to 50 percent.

DDR4 Details

There are subtle differences between DDR3 and DDR4 memory modules, as listed below.

Key notch difference

The key notch on a DDR4 module is in a different location from the key notch on a DDR3 module. Both notches are on the insertion edge but the notch location on the DDR4 is slightly different, to prevent the module from being installed into an incompatible board or platform.

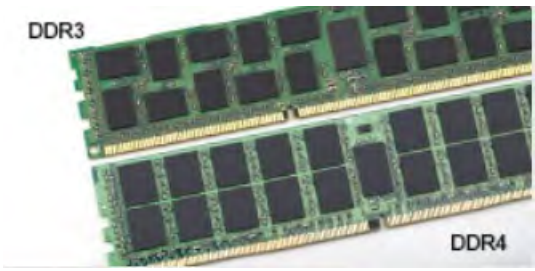


Figure 4. Notch difference

Increased thickness

DDR4 modules are slightly thicker than DDR3, to accommodate more signal layers.

Figure 5. Thickness difference

Curved edge

DDR4 modules feature a curved edge to help with insertion and alleviate stress on the PCB during memory installation.

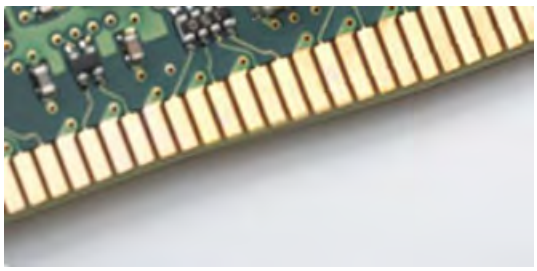


Figure 6. Curved edge

Memory Errors

Memory errors on the system display the new 2 - Amber, 3 - White failure code. If all memory fails, the LCD does not turn on. Troubleshoot for possible memory failure by trying known good memory modules in the memory connectors on the bottom of the system or under the keyboard, as in some portable systems.

Memory features

This laptop supports 4–32 GB DDR4 SDRAM memory, up to 2400 MHz on KabyLake processors and 2133 MHz on SkyLake processors.

Verifying system memory

Windows 10

1 Tap the **Windows** button and select **All Settings** > **System** .
2 Under **System**, tap **About**.

Windows 8

1 From your desktop, start the **Charms Bar**.
2 Select **Control Panel** and then select **System**.

Windows 7

- Click **Start** → **Control Panel** → **System**.

Verifying system memory in system setup BIOS

1 Turn on or restart your system.
2 Perform the following actions after the Dell logo is displayed
   - With keyboard — Tap F2 until the Entering BIOS setup message appears. To enter the Boot selection menu, tap F12.
3 On the left pane, select **Settings** > **General** > **System Information**,
   The memory information is displayed on the right pane.

Testing memory using ePSA

1 Turn on or restart your system.

2 Perform one of the following actions after the Dell logo is displayed:

- With keyboard — Press **F12**.

The PreBoot System Assessment (PSA) starts on your system.

NOTE: If you wait too long and the operating system logo appears, continue to wait until you see the desktop. Turn off the laptop and try again.

Graphics options

Graphics Specifications

Table 32. Graphics specifications

Controller	Type	CPU Dependency	Graphics memory type	Capacity	External display support	Maximum resolution
Intel HD 620 Graphics	UMA	Intel Core i3 - 7130U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
Intel UHD 620 Graphics	UMA	Intel Core i5 - 8350U Intel Core i7 - 8650U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
Intel HD 520 Graphics	UMA	Intel Core i5-6300U	Integrated	Shared system memory	HDMI 2.0	4096×2304 @60 Hz
AMD Radeon 540	Discreet	Intel Core i5 - 8350U Intel Core i7 - 8650U	Discreet	Dedicated, 2 GB DDR5	HDMI 2.0 Additional video ports via Rear Configurable IO Space • VGA • DisplayPort	4096×2304 @60 Hz
AMD Radeon RX540	Discrete	Intel Core i5 - 8350U Intel Core i7 - 8650U	Discreet	Dedicated, 4 GB DDR5	HDMI 2.0 Additional video ports via Rear Configurable IO Space • VGA • DisplayPort	4096×2304 @60 Hz

NOTE: Additional video ports via Rear Configurable IO Space is available with discreet graphics solution only.

Intel HD Graphics Integrated

Intel HD graphics 620

This system can be configured with either of the following UMA graphic options or combined with any of the AMD discreet graphics options.

Table 33. Intel HD graphics 620 specification

Integrated Graphics Controller	Intel HD Graphics 620
Bus Type	Internal PCIe
Memory Interface	N/A (unified memory architecture)
Graphics Level	GT2
Estimated Maximum Power Consumption (TDP)	15 W (included in the CPU power)
Display Support	On System: HDMI 2.0 USB Type-C
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	Support for DirectX 12, OpenCL 2.0, OpenGL 4.3/4.4, OpenGL ES
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	System ports: Max Digital: (HDMI) 2560x1600, 4096x2304@24 Hz Docked: • Max Digital: (DisplayPort 1.2) 3840 x2160 @60 Hz • Max Digital: (SL-DVI) 1920x1080 @60 Hz • Analog: (VGA) system (14 inch/15 inch) 2048x1152 @60 Hz For 3 displays : up to max resolution each above
Numbers of Displays Supported	• System Ports: 3 displays max with LCD plus 2 displays max on each output (HDMI, USB Type-C) • Docked: 3 displays max (combo of LCD, VGA, DP, HDMI)

Intel UHD Graphics 620

Table 34. Intel UHD Graphics 620 (8th Generation Intel Core) specification

Integrated Graphics Controller	Intel UHD Graphics 620 (8th Generation Intel Core)
Bus Type	Internal PCIe
Memory Interface	N/A (unified memory architecture)
Graphics Level	GT2
Estimated Maximum Power Consumption (TDP)	15 W (included in the CPU power)
Display Support	On System: HDMI 2.0 USB Type-C

Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	DirectX 11 (Windows 7/8.1), DirectX 12 (Windows 10), OpenGL 4.3
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	System ports: • Max Digital: (HDMI) 4096x2304@24 Hz • Analog: (VGA) system (14 inches/15 inches) or docking 2048x1152 @60 Hz Docked: • Max Digital: (DisplayPort 1.2) 3860 x2160 @60 Hz • Max Digital: (SL-DVI) 1920x1080 @60 Hz • Analog: (VGA) system (14 inches/15 inches) 2048x1152 @60 Hz For 3 displays: • (native or docked) up to 1920x1200 max resolution each
Numbers of Displays Supported	• System Ports - 3 displays max with LCD plus 1 display max on each output (HDMI, VGA (14 inches/15 inches) • Docked - 3 displays max (combo of LCD, VGA, DP, HDMI)

Intel HD Graphics 520

Table 35. Intel HD Graphics 520 Graphics specification

Integrated Graphics Controller	**Intel UHD Graphics 620 (8th Generation Intel Core)**
Bus Type	Internal PCIe
Memory Interface	N/A (unified memory architecture)
Graphics Level	GT2
Estimated Maximum Power Consumption (TDP)	15 W (included in the CPU power)
Display Support	On System: HDMI 2.0 USB Type-C
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	DirectX 11 (Windows 7/8.1), DirectX 12 (Windows 10), OpenGL 4.3
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	System ports: • Max Digital: (HDMI) 4096x2304@24 Hz • Analog: (VGA) system (14 inches/15 inches) or docking 2048x1152 @60 Hz Docked: • Max Digital: (DisplayPort 1.2) 3860 x2160 @60 Hz • Max Digital: (SL-DVI) 1920x1080 @60 Hz • Analog: (VGA) system (14 inches/15 inches) 2048x1152 @60 Hz For 3 displays: • (native or docked) up to 1920x1200 max resolution each

Numbers of Displays Supported	• System Ports - 3 displays max with LCD plus 1 display max on each output (HDMI, VGA (14 inches/15 inches) • Docked - 3 displays max (combo of LCD, VGA, DP, HDMI)

Intel HD Graphics 520

The Intel HD Graphics 520 (GT2) is an integrated graphics unit, which can be found in various ULV (Ultra Low Voltage) processors of the Skylake generation. This GT2 version of the Skylake GPU offers 24 Execution Units (EUs) clocked at up to 1050 MHz (depending on the CPU model). Due to its lack of dedicated graphics memory or eDRAM cache, the HD 520 has to access the main memory (2x 64-bit DDR3L-1600/DDR4-2133).

Performance

The exact performance of the HD Graphics 520 depends on various factors like L3 cache size, memory configuration (DDR3/DDR4) and maximum clock rate of the specific model. The fastest versions Core i7-6600U should perform similar to a dedicated GeForce 820M and handles modern games (as of 2015) in low settings.

Features

The revised video engine now decodes H.265/HEVC completely in hardware and more efficiently than before. Displays can be connected using a DP 1.2/eDP 1.3 (max. 3840 x 2160 @ 60 Hz), whereas HDMI is limited to the older version 1.4a (max. 3840 x 2160 @ 30 Hz). However, HDMI 2.0 can be added using a DisplayPort converter. Up to three displays can be controlled simultaneously.

Power Consumption

The HD Graphics 520 can be found in mobile processors specified at 15 W TDP and is therefore suited for compact laptops and Ultrabooks.

Key Specifications

The following table contains the key specifications of the Intel HD Graphics 520:

Table 36. Key specifications

Specification	Intel HD Graphics 520
Codename	Skylake GT2
Architecture	Intel Gen 6 (Skylake)
Pipelines	24 — unified
Core Speed	300 — 1050 (Boost) MHz

Specification	Intel HD Graphics 520
Memory Type	DDR3/DDR4
Memory Bus Width	64/128 bit
Shared Memory	Yes
Technology	14 nm
Features	QuickSync
DirectX	DirectX 12 (FL 12_1)
Max. Displays Supported	Up to 3
DP 1.2/eDP 1.3 max. resolution	3840 x 2160 @ 60 Hz
HDMI max. resolution	3840 x 2160 @ 30 Hz

Intel HD/UHD Graphics 620

The Intel HD/UHD Graphics 620 (GT2) is an integrated graphics unit, which can be found in various ULV (Ultra Low Voltage) processors of the Skylake generation. This GT2 version of the Skylake GPU offers 24 Execution Units (EUs) clocked at up to 1050 MHz (depending on the CPU model). Due to its lack of dedicated graphics memory or eDRAM cache, the HD 520 has to access the main memory (2x 64-bit DDR3L-1600/DDR4-2133).

Performance

The exact performance of the HD/UHD Graphics 620 depends on various factors like L3 cache size, memory configuration (DDR3L/DDR4) and maximum clock rate of the specific model.

Features

The revised video engine now decodes H.265/HEVC completely in hardware and more efficiently than before. Displays can be connected using a DP 1.2/eDP 1.3 (max. 3840 x 2160 @ 60 Hz), whereas HDMI is limited to the older version 1.4a (max. 3840 x 2160 @ 30 Hz). However, HDMI 2.0 can be added using a DisplayPort converter. Up to three displays can be controlled simultaneously.

Power Consumption

The HD Graphics 620 can be found in mobile processors specified at 15 W TDP and is therefore suited for compact laptops and Ultrabooks.

Key Specifications

The following table contains the key specifications of the Intel HD Graphics 620:

Table 37. Key specifications

Specification	Intel HD/UHD Graphics 620
Codename	Skylake GT2
Architecture	Intel Gen 6 (Skylake)
Pipelines	24 — unified
Core Speed	300 — 1050 (Boost) MHz
Memory Type	DDR3/DDR4
Memory Bus Width	64/128 bit
Shared Memory	Yes
Technology	14 nm
Features	QuickSync
DirectX	DirectX 12 (FL 12_1)
Max. Displays Supported	Up to 3
DP 1.2/eDP 1.3 max. resolution	3840 x 2160 @ 60 Hz
HDMI max. resolution	3840 x 2160 @ 30 Hz

AMD Radeon 540 Graphics

Table 38. Radeon 540 Graphics specifications

Graphics Controller	AMD Radeon 540 Graphics
Graphics memory	2 Gbit GDDR5
Bus type	PCIe x16 Gen3
Memory Interface	64-bit
Clock Speeds	Up to 1124 MHz
Estimated Maximum Power Consumption (TDP)	50W TGP (GPU + frame buffer)
Display Support	HDMI/mDP/eDP/USB-C
Maximum Color Depth	Maximum 4:4:4 Color Depth:12 (bits per pixel)
Maximum Vertical Refresh Rate	Up to 85 Hz depending on resolution
Operating Systems Graphics/ Video API Support	DirectX 12, OpenGL 4.5
Supported Resolutions and Max Refresh Rates (Hz) (Note: Analog and/or digital)	• Single DisplayPort 1.4 - 7680 x 4320 (8k) @ 30 Hz • Dual DisplayPort 1.4 - 7680 x 4320 (8k) @ 60 Hz

	• HDMI 2.0 - 4096 x2160 (4K) @ 60 Hz
Numbers of Display Support	Up to two displays

AMD Radeon RX 540 Graphics

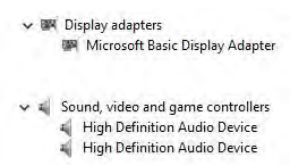
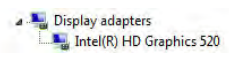
Table 39. Radeon RX 540 graphics specifications

Graphics Controller	**AMD Radeon RX 540 Graphics**
Graphics memory	4 GB GDDR5
Bus type	PCIe x16 Gen3
Memory Interface	128 bit
Clock Speeds	Up to 1219 MHz
Estimated Maximum Power	50W TGP (GPU + frame buffer)
Display Support	eDP/DVI/ DisplayPort/HDMI
Maximum Color Depth	Maximum 4:4:4 Color Depth:12 (bits per pixel)
Maximum Vertical Refresh Rate	Up to 395 Hz at 1920 x 1080 Up to 118 Hz at 3840 x 2160
Operating Systems Graphics/ Video API Support	DirectX 12, OpenGL 4.5
Supported Resolutions and Max Refresh Rates (Hz)	• Max Digital : Single DisplayPort 1.4 - 7680 x 4320 (8k) @ 30 Hz (mDP/USB Type-C to DP) • Max Digital : Dual DisplayPort 1.4 - 7680 x 4320 (8k) @ 60 Hz (mDP/USB Type-C to DP)
Numbers of Display Support	Up to four displays

Intel HD Graphics drivers

Verify if the Intel HD Graphics drivers are already installed in the laptop.

Table 40. Intel HD Graphics drivers

Before installation	**After installation**
	

Display Specifications

Table 41. Display Specifications

- 14" FHD Wide View Angle(WVA) (1920 x 1080) Anti-Glare Non-Touch, No Camera & No Microphone
- 14" FHD WVA (1920 x 1080) Anti-Glare Non-Touch, Camera with Privacy Shutter & Microphone
- 14" FHD WVA (1920 x 1080) Anti-Glare Non-Touch, Outdoor-Readable Screen, Camera with Privacy Shutter & Microphone
- 14" FHD WVA (1920 x 1080) Anti-Glare Non-Touch, Outdoor-Readable Screen, No Camera & No Microphone
- 14" FHD WVA (1920 x 1080) Embedded Touch, Outdoor-Readable Screen, Camera with Privacy Shutter & Microphone, Stylus included
- 14" FHD WVA (1920 x 1080) Embedded Touch, Outdoor-Readable Screen, Infra Red(IR) Camera with Privacy Shutter & Microphone, Stylus included
- 14" FHD WVA (1920 x 1080) Embedded Touch, Outdoor-Readable Screen, No Camera & No Microphone, Stylus included

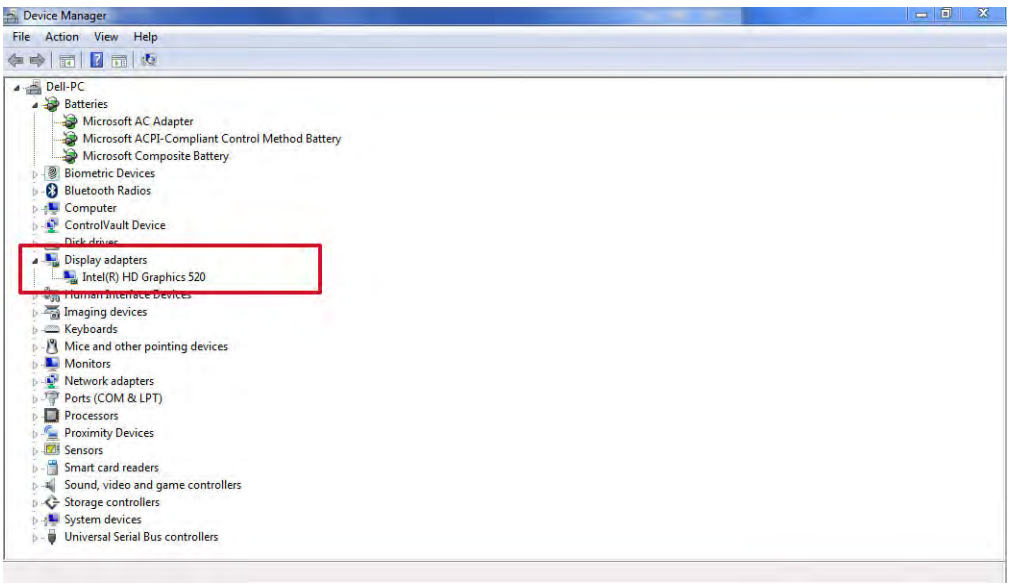
Identifying the display adapter

1 Start the **Search Charm** and select **Settings**.

2 Type `Device Manager` in the search box and tap **Device Manager** from the left pane.

3 Expand **Display adapters**.

The display adapters are displayed.



Downloading drivers

1 Turn on the laptop.

2 Go to **Dell.com/support**.

3 Click **Product Support**, enter the Service Tag of your laptop, and then click **Submit**.

NOTE: If you do not have the Service Tag, use the auto detect feature or manually browse for your laptop model.

4 Click **Drivers and Downloads**.

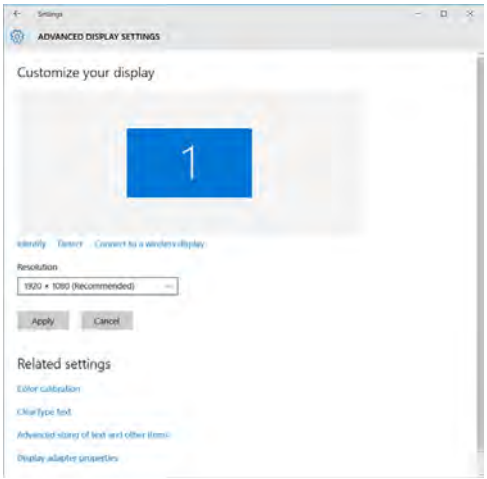
5 Select the operating system installed on your laptop.

6 Scroll down the page and select the driver to install.

7 Click **Download File** to download the driver for your laptop.
8 After the download is complete, navigate to the folder where you saved the driver file.
9 Double-click the driver file icon and follow the instructions on the screen.

Changing the screen resolution

1 Press and hold the desktop screen and select **Display Settings**.
2 Tap or click **Advanced display settings**.
3 Select the required resolution from the drop-down list and tap **Apply**.



Using touch screen in Windows 8/ Windows 10

Follow these steps to enable or disable the touch screen:

1 Go to the Charms Bar and tap **All Settings**.
2 Tap **Control Panel**.
3 Tap **Pen and Input Devices** in the **Control Panel**.
4 Tap the **Touch** tab.
5 Select **Use your finger as an input device** to enable the touch screen. Clear the box to disable the touch screen.

Connecting to external display devices

Follow these steps to connect your laptop to an external display device:

1 Ensure that the external display device is turned on and plug the external display device cable into a video port on your laptop.
2 Press the Windows logo+P key.
3 Select one of the following modes:
- PC screen only
- Duplicate
- Extend
- Second Screen only

NOTE: For more information, see the document that shipped with your display device.

Adjusting brightness in Windows 7

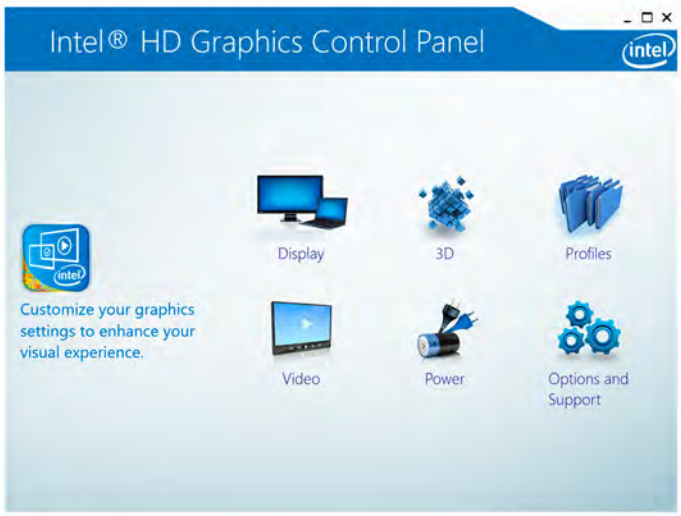
To enable or disable automatic screen brightness adjustment:

1 Click **Start → Control Panel → Display.**
2 Use the **Adjust brightness** slider to enable or disable automatic-brightness adjustment.

NOTE: You can also use the Brightness level slider to adjust the brightness manually.

Changing the display settings in Intel HD Graphics Control Panel

1 Right-click your desktop and select **Graphics Properties** to launch the **Intel HD Graphics Control Panel**.



2 Click **Display**.
3 Change the display settings as required.

Adjusting brightness in Windows 10

To enable or disable automatic screen brightness adjustment:

1 Swipe-in from the right edge of the display to access the Action Center.
2 Tap or click **All Settings** > **System** > **Display**.
3 Use the **Adjust my screen brightness automatically** slider to enable or disable automatic-brightness adjustment.

NOTE: You can also use the Brightness level slider to adjust the brightness manually.

Cleaning the display

1 Check for any smudges or areas that must be cleaned.
2 Use a microfiber cloth to remove any obvious dust and gently brush off any dust particles.
3 Proper cleaning kits should be used to clean and keep your display in a crisp clear pristine condition.

NOTE: Never spray any cleaning solutions directly on the screen; spray it to the cleaning cloth.

4 Gently wipe the screen in a circular motion. Do not press hard on the cloth.

NOTE: Do not press hard or touch the screen with your fingers or you may leave oily prints and smears.

NOTE: Do not leave any liquid on the screen.

5 Remove all excess moisture as it may damage your screen.

6 Let the display dry thoroughly before you turn it on.

7 For stains that are hard to remove, repeat this procedure till the display is clean.

Identifying the display adapter

1 On the taskbar, click or tap the search box, and then type `Device Manger`.

2 Click or tap **Device Manager**.
The **Device Manager** window is displayed.

3 Expand **Display adapters**.

Figure 7. Display adapters

Corning Gorilla Glass

Corning Gorilla Glass 5: Corning's latest composition was formulated to address breakage the #1 consumer complaint, according to Corning's research. The new glass is just as thin and light as previous versions, but has been formulated to deliver dramatically improved native damage resistance allowing improved in-field performance. Corning Gorilla Glass 5 has been tested for performance when subjected to sharp contact damage, such as asphalt and other real-world surfaces.

Benefits

- Enhanced retained strength after use.
- High resistance to scratch and sharp contact damage.
- Improved drop performance.
- Superior surface quality.

Applications

- Ideal protective cover for electronic displays in:
  - Smartphones
  - Laptop and tablet computer screens
  - Wearable devices
- Touchscreen devices
- Optical components
- High strength glass articles

Dimensions

Thickness: 0.7 mm

Viscosity

Table 42. Viscosity

Softening Point ($10^{7.6}$ poises)	884˚C
Annealing Point ($10^{13.2}$ poises)	623˚C
Strain Point ($10^{14.7}$ poises)	571˚C

Properties

Table 43. Properties

Density	2.43 g/cm
Youngs Modulus	76.7 GPa
Poissons Ratio	0.21
Shear Modulus	31.7 GPa
Vickers Hardness (200 g load)	
• Un-strengthened • Strengthened	489 kgf/mm^2 596 kgf/mm^2
	596 kgf/mm^2
Fracture Toughness	0.69 MPa m$^{0.5}$
Coefficient of Expansion (0 ˚C - 300 ˚C)	78.8 x 10^{-7} /°C

Chemical Strengthening

Capability of >850MPa CS, at 50 µm Depth Of Layer(DOL)

Specifications subject to change

Optical

Table 44. Optical

Refractive Index (590 nm)	
Core glass**	1.50
Compression layer	1.51
Photo-elastic constant	30.3 nm/cm/MPa

** Core index is used for FSM-based measurements since it is unaffected by ion-exchange conditions.

Chemical Durability

Durability is measured via weight loss per surface area after immersion in the solvents shown below. Values are highly dependent upon actual testing conditions. Data reported is for Corning Gorilla Glass 5.

Table 45. Chemical Durability

Reagent	Time	Temperature (ºC)	Weight Loss (mg/cm2)
HCl - 5%	24 hrs	95	5.9
NH4F:HF - 10%	20 min	20	1.0
HF - 10%	20 min	20	25.2
NaOH - 5%	6 hrs	95	2.7

Electrical

Table 46. Electrical

Frequency (MHz)	Dielectric Constant	Loss Tangent
54	7.08	0.009
163	7.01	0.010
272	7.01	0.011
272	7.00	0.010
490	7.99	0.010
599	7.97	0.011
912	7.01	0.012
1499	6.99	0.012
1977	6.97	0.014
2466	6.96	0.014
2986	6.96	0.014

Terminated coaxial line similar to that outlined in NIST Technical Notes 1520 and 1355-R

Putting Corning Gorilla Glass 5 to the test.

- Greater damage resistance (upto 1.8X) with deep abrasion.
- Faster chemical strengthening with high Compressive Stress and deeper depth of compression
  - Shallower check depth with higher abrasions levels
- Enables thickness reduction

Touchscreen Troubleshooting

If the touchscreen is not able to access items along the edges of the LCD, it may need to be calibrated. To calibrate the touchscreen, complete the following steps:

Touchscreen Calibration

Start > Control Panel > Tablet PC Settings > choose Calibrate...You can choose to calibrate Pen input or Touch input.

Perform the point calibrations that appear on the screen to correct the linearity problems.

Touchscreen Sensitivity

The touch screen may start to lose its sensitivity due to foreign particles (such as sticky notes) that are blocking the touch sensors. To remove these particles:

- Turn off the computer.
- Disconnect the AC adapter cable from the wall outlet.

NOTE: Do not use water or a cleaning liquid to wipe the touch screen.

- Use a clean, lint-free cloth (you may spray mild, non-abrasive cleaner or water on the cloth if needed, but not on the screen) and wipe the surface and sides of the touch screen to remove any dirt or fingerprints.

Application Promise

Consistent experience across form factors is what's necessary - a user can download any application from the Windows Store and it runs great on their machine. There is no application that runs great on one device but not on another. This means developers can target all Windows 8 and this version of Windows touch devices without worrying about the quality of touch devices depending on the type of form factor. For example, all Windows 8 touch devices require supporting a minimum of five simultaneous touches. All touch points require meeting requirements of 25 ms initial touch-down hardware latency and 15 ms subsequent contacts hardware latency. Game developers can design features based on fast and responsive five simultaneous touch points support across all Windows 8 touch devices.

Pen Usage

Your computer uses several input devices. The standard external USB keyboard and mouse are present, plus you can opt for the electrostatic pen/stylus or use your finger as an input device.

Using the Pen as a Mouse

You can use the pen the same way you use a mouse or touch pad with a notebook computer. Holding the pen near the display makes a small cursor appear. Moving the pen moves the cursor. The following table describes how to use the pen.

Table 47. Electrostatic Pen Usage

Action	Function
Gently tap the pen tip on the screen	Same as a single-click on a mouse.
Gently tap the pen tip twice in quick succession on the screen.	Same as a double-click on a mouse.
Touch the pen on the screen and hold it in place momentarily until Windows draws a complete circle around the cursor.	Same as a right-click on a mouse.

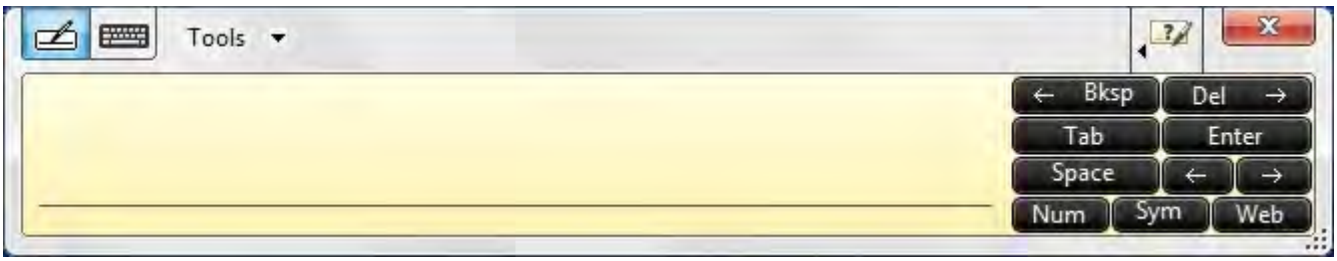
Using the Pen as a Pen

The handwriting recognition software makes it easy to enter text into your applications with the pen. Some applications, such as Windows Journal, allow you to write with the pen directly into the application window.

Tablet PC Input Panel

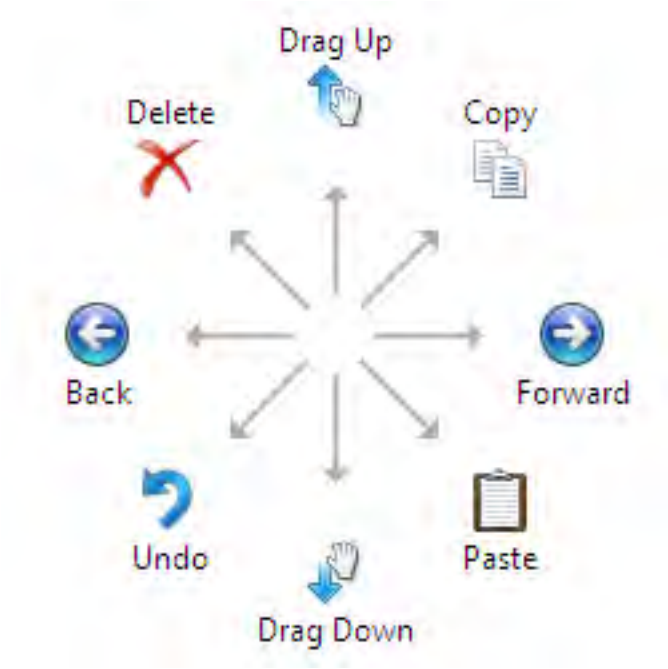
When an application does not directly support pen input, you can use the **Tablet PC Input Panel** to enter text into your application. If you tap in an editable area, the Tablet PC Input Panel icon appears. Tapping the icon makes the Input Panel slide out from the edge of the display.

You can move the **Input Panel** tab by dragging it up or down along the edge of the screen. Then, when you tap it, the Input Panel opens at the same horizontal location on the screen that the tab appears.



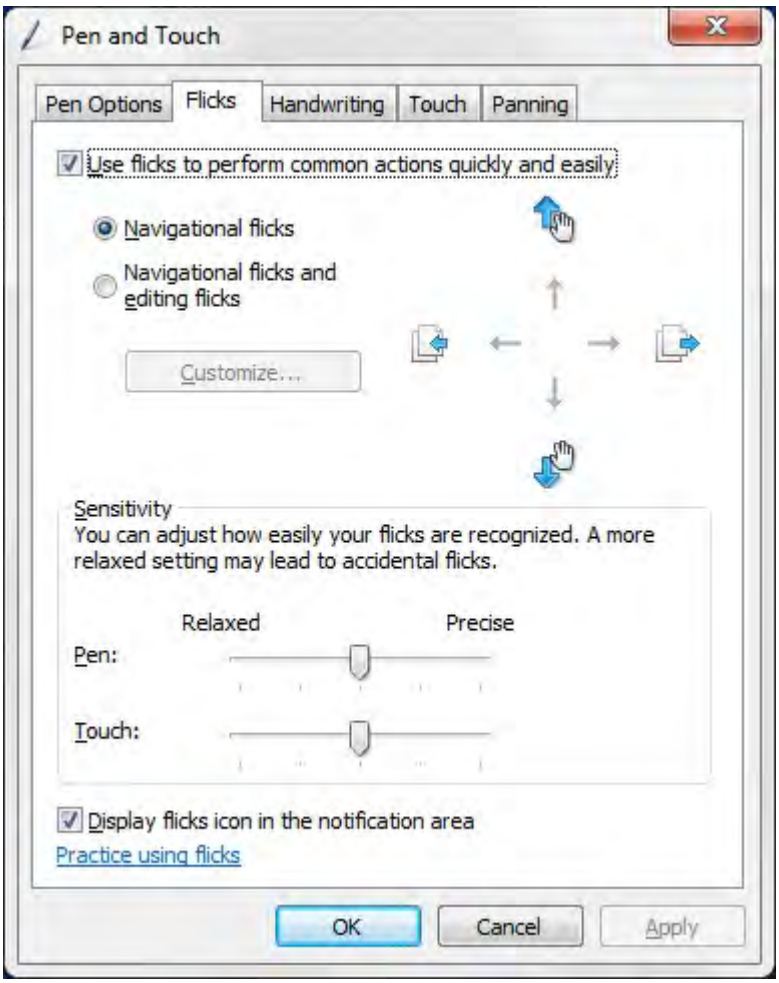
Pen Flicks

Pen flicks enable you to use the pen to perform actions that normally require a keyboard, such as pressing <Page Up> or using the directional arrow keys. Pen flicks are quick, directional gestures. Draw a short line in one of eight directions. When a pen flick is recognized, the Tablet PC performs the action assigned.



You can modify the default pen flick settings:

1 Click **Start** > **Control Panel** > **Pen and Touch** and click the **Flicks** tab.
2 Modify the settings and click **OK.**



Troubleshooting Your Pen

The stylus is the first component to be investigated in the event of a suspected problem with the digitizer.

Ensure that you perform the following steps:

1 Verify the pen tip is in good shape (free of chips, excessive wear, etc.).

2 Replace the pen tip with a new one or the one that is in good condition.

3 Verify that the touch capabilities are not affected.

4 Switch to touch mode and see if the problem still exists.

5 If no symptoms persist in touch mode, the pen tip is the most likely suspect.

6 If the problem does persist in touch mode, run diagnostics and take the necessary steps depending on the results.

Optical Disk Drive

DVDRW

DVDRW is a physical format for re-writable DVDs and can hold up to 4.7 GB. DVD+RW was created by the DVD+RW Alliance, an industry consortium of drive and disc manufacturers. Additionally, DVD+RW supports a method of writing called "lossless linking", which makes it suitable for random access and improves compatibility with DVD players.

The capacity of a single-layer disc is approximated as 4.7 x 109 bytes. In actuality, the disc is laid out with 2295104 sectors of 2048 bytes each which comes to 4,700,372,992 bytes, 4,590,208 kilobytes (KiB, binary kilobytes), 4482.625 megabytes (MiB, binary megabytes), or 4.377563476 gibabytes (GiB, binary gigabytes).

DVD±R (also DVD+/-R, "DVD plus/dash R", or "DVD plus/minus R") is not a separate DVD format, but rather is a shorthand term for a DVD drive that can accept both of the common recordable DVD formats (i.e. DVD-R and DVD+R). Likewise, DVD±RW (also written as DVD ±R/W, DVD±R/RW, DVD±R/±RW, DVD+/-RW, and other arbitrary ways) handles both common re-writable disc types

DVD+RW must be formatted before recording by a DVD recorder.

- 8x DVD+/-RW drive

DVDRW Drive

There is a new drive offering from Dell for these systems that allows users to read and write DVDs and CDs. The drive is a tray-loading drive that fits into the media bay. It uses a SATA interface.

The DVDRW/BD-ROM combo drive will read and write all standard CD and DVD formats. Here are some specifications for the drive:

Table 48. DVD RW Specifications

DVDRW Drive Specs	
Format	Speed
CD Read	24x
CD-R write	8x
CD-RW write	8x
DVD-ROM read	8x
DVD+R write	8x
DVD-R write	8x
DVD+R DL write	2.4x
DVD-R DL write	2.4x
DVD+RW write	4x
DVD-RW write	4x

Blue Ray

In February 2002, a large group of companies announced the introduction of the Blu-ray Disc™ (BD) format, the next generation in optical storage. The new format offers an immense storage capacity (up to 50 GB) that is perfect for high-definition (HD) video recording and distribution, as well as for storing large amounts of data. The format shares the same form factors as existing CD and DVD optical discs, allowing for backwards compatibility.*

Features

Listed below are some of Blu-ray's features.

- Huge capacity
  - 25 GB (single layer) / 50 GB (double layer)

NOTE: All Dell Blu-Ray drives support dual layer (50 GB) discs. However, the new combo drives (DVDRW/BD-ROM) simply read dual layer discs but do not write to them.

- Future potential to store 200 GB (Multilayer)
  - Ability to burn and read most media types**
  - Common format advantage
    - Blank media
    - Set top recorders and players
    - Prepackaged high-definition movies
    - High-definition camcorders
    - Next-generation HD gaming
    - PC storage and entertainment

Hardware Requirements

For Blu-ray to work properly, both software and hardware must meet several requirements. A description of these requirements is below. A Dell™ Blu-ray Disc system cannot be purchased without these requirements.

Table 49. System Requirements

Requirement	Device/Specification	
	Desktops	Notebooks
Processor	Intel® Core™2 Duo Processor E6800 (2.93 GHz) or Intel Core 2 Duo Processor E6700 (2.66 GHz) or Kentsfield	Intel Core 2 Duo T7100 (1.8 GHz) or better
Graphics card	Intel Core 2 Duo T7100 (1.8 GHz) or better	Intel Core 2 Duo T7100 (1.8 GHz) or better
Memory	1 GB DDR2 SDRAM	
RMSD drive	Philips® half-height drive	Panasonic® Slim-line drive
Software	Playback: Cyberlink® Burn and authoring: Sonic/Roxio	
Video	Codecs: MPEG2, MPEG4-AVC, VC-1 - must be capable of H.264 HW accel	
Audio	Codecs: LPCM, Dolby®, Dolby Digital +, Dolby Lossless, DTS™, DTS-HD™	
Display	20-inch high-definition flat panel (HDFP) - 2007FPW 24-inch high-definition flat panel (HDFP) - 2407FPW Must have HDCP** support with digital connectors	WSXGA+ (1680x1050) WUXGA (1920x1200)

There are a few possible profiles for Blu-ray; they are Standard and BD Live.

Table 50. Blue-ray Profiles

	Standard	BD Live (Not yet available)
Functionality	Large back-up device	Standard Profile + Picture-in-Picture
	Blu-ray video playback	Internet connectivity
	Blu-ray video authoring	Local storage
System requirements	Drive	Standard Profile + Hardware-accelerated graphics
	Graphics/CPU combination sufficient to handle BD	System storage
	BD software	
	Monitor	
	Memory	

Media Card Reader

NOTE: The media card reader is integrated into the system board on portable systems. If there is a hardware failure or the reader malfunctions, replace the system board.

The media card reader expands the usefulness and functionality of portable systems, especially when used with other devices such as digital cameras, portable MP3 players, and handheld devices. All these devices use a form of media card to store information. Media card readers allows for easy transfer of data between these devices.

Several different types of media or memory cards are available today. Below is a list of the different types of cards that work in the media card reader.

1	Memory Stick	2	Memory Stick PRO
3	Secure Digital (SD)	4	SDIO card
5	MultiMediaCard (MMC)	6	xD-Picture Card

In addition, the following types of media cards work in the ExpressCard slot using an adapter from the card manufacturer:

- CompactFlash (CF) Type I
- CompactFlash (CF) Type II, including the IBM Microdrive

AC Adapters

There are a two types of AC adapters offered for this platform:

- 90W 3-Pin
- 130W 3-Pin

- When you disconnect the AC adapter cable from the computer, grasp the connector, not the cable itself, and then pull firmly but gently to avoid damaging the cable.
- The AC adapter works with electrical outlets worldwide. However, power connectors and power strips vary among countries. Using an incompatible cable or improperly connecting the cable to the power strip or electrical outlet may cause fire or equipment damage.

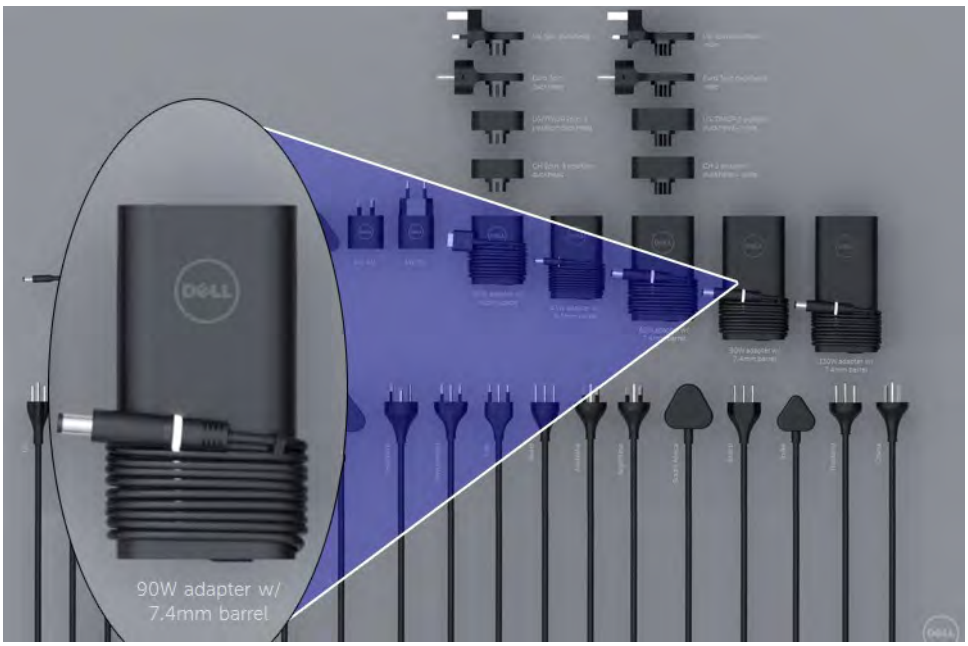
How to check the status of AC Adapter in BIOS?

1 Restart / Power on your computer.

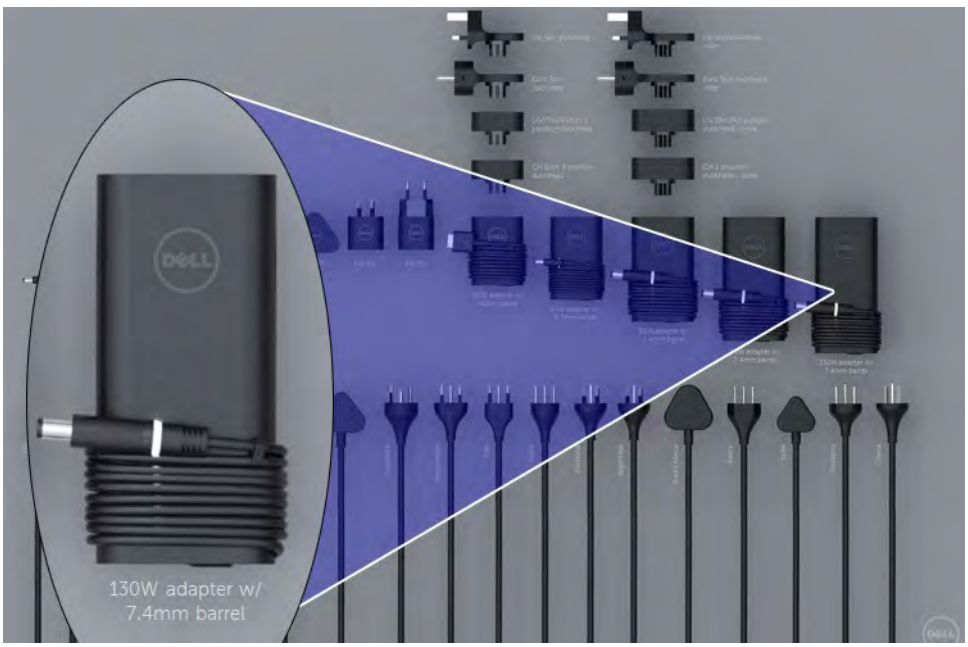
2 At the first text on the screen or when the Dell logo appears, tap <F2> until the message **Entering Setup** appears.

3 Under **General** > **Battery Information**, you will see **AC Adapter** listed.

90W



130W



LED and Cable

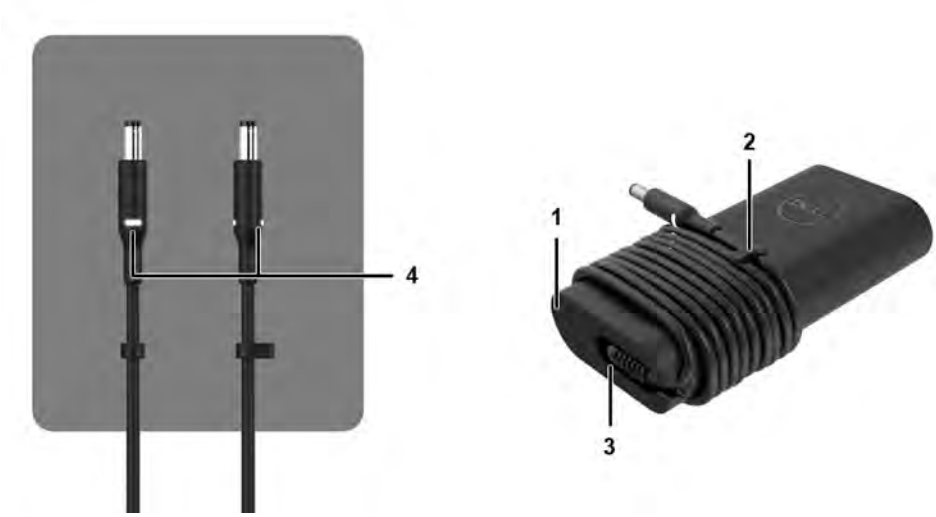


Table 51. Adapter Features

Features	
1	Body shape creates a smooth base for cable wrapping.
2	Cable lock on cord for securing cable wrap.
3	90° strain relief directs the cable out the side of the adapter.
4	Adapter LED is implemented in two spots on opposite sides of the plug head. The LED illumination will be white.

Battery

Dell Latitude Rugged use the following 2-cell battery options:

- 3-cell 51 Whr (ExpressCharge)
- 3-cell 51 Whr (Long-Life Cycle, includes 3 year limited warranty)

The battery is located on the rear of the system and is hot swap capable. This design is unlike any other Dell predecessors laptops, where system needs to be powered off when the battery is removed, without the need to remove the bottom cover.

NOTE: Battery can be categorized as a CRU (Customer Replaceable Unit)

NOTE: A tablet battery typically requires about 4 hours to fully charge.

Battery Specifications

What is ExpressCharge ?

For a system advertised as having the ExpressCharge feature, the battery typically will have greater than 80% charge after about an hour of charging with the system off and fully charged in about 2 hours with the system off.

Enabling Expresscharge requires that both the system and the battery that is used on the system be ExpressCharge capable. If any of the above requirements is missing, ExpressCharge will not be enabled.

What is BATTMAN?

BATTMAN is a computer controlled battery manager intended for typical rechargeable batteries. It has the following capabilities:

- Monitors self-discharge
- Measures internal resistance
- Automatically performs repeated discharge/charge cycles to break in new batteries
- Keeps a log of all operations performed, which can be imported
- Connects via parallel port to any PC running Microsoft Windows
- Operating software, complete with source code, is available to download

HDMI 2.0

This topic explains the HDMI 2.0 and its features along with the advantages.

HDMI (High-Definition Multimedia Interface) is an industry-supported, uncompressed, all-digital audio/video interface. HDMI provides an interface between any compatible digital audio/video source, such as a DVD player, or A/V receiver and a compatible digital audio and/or video monitor, such as a digital TV (DTV). The intended applications for HDMI TVs, and DVD players. The primary advantage is cable reduction and content protection provisions. HDMI supports standard, enhanced, or high-definition video, plus multichannel digital audio on a single cable.

HDMI 2.0 Features

- **HDMI Ethernet Channel** - Adds high-speed networking to an HDMI link, allowing users to take full advantage of their IP-enabled devices without a separate Ethernet cable
- **Audio Return Channel** - Allows an HDMI-connected TV with a built-in tuner to send audio data "upstream" to a surround audio system, eliminating the need for a separate audio cable
- **3D** - Defines input/output protocols for major 3D video formats, paving the way for true 3D gaming and 3D home theater applications
- **Content Type** - Real-time signaling of content types between display and source devices, enabling a TV to optimize picture settings based on content type
- **Additional Color Spaces** - Adds support for additional color models used in digital photography and computer graphics
- **4K Support** - Enables video resolutions far beyond 1080p, supporting next-generation displays that will rival the Digital Cinema systems used in many commercial movie theaters
- **HDMI Micro Connector** - A new, smaller connector for phones and other portable devices, supporting video resolutions up to 1080p
- **Automotive Connection System** - New cables and connectors for automotive video systems, designed to meet the unique demands of the motoring environment while delivering true HD quality

Advantages of HDMI

- Quality HDMI transfers uncompressed digital audio and video for the highest, crispest image quality.
- Low -cost HDMI provides the quality and functionality of a digital interface while also supporting uncompressed video formats in a simple, cost-effective manner
- Audio HDMI supports multiple audio formats from standard stereo to multichannel surround sound
- HDMI combines video and multichannel audio into a single cable, eliminating the cost, complexity, and confusion of multiple cables currently used in A/V systems
- HDMI supports communication between the video source (such as a DVD player) and the DTV, enabling new functionality

USB features

Universal Serial Bus, or USB, was introduced in 1996. It dramatically simplified the connection between host computers and peripheral devices like mice, keyboards, external drivers, and printers.

Let's take a quick look on the USB evolution referencing to the table below.

Table 52. USB evolution

Type	Data Transfer Rate	Category	Introduction Year
USB 2.0	480 Mbps	High Speed	2000
USB 3.0/USB 3.1 Gen 1	5 Gbps	Super Speed	2010
USB 3.1 Gen 2	10 Gbps	Super Speed	2013

USB 3.0/USB 3.1 Gen 1 (SuperSpeed USB)

For years, the USB 2.0 has been firmly entrenched as the de facto interface standard in the PC world with about 6 billion devices sold, and yet the need for more speed grows by ever faster computing hardware and ever greater bandwidth demands. The USB 3.0/USB 3.1 Gen 1 finally has the answer to the consumers' demands with a theoretically 10 times faster than its predecessor. In a nutshell, USB 3.1 Gen 1 features are as follows:

- Higher transfer rates (up to 5 Gbps)
- Increased maximum bus power and increased device current draw to better accommodate power-hungry devices
- New power management features
- Full-duplex data transfers and support for new transfer types
- Backward USB 2.0 compatibility
- New connectors and cable

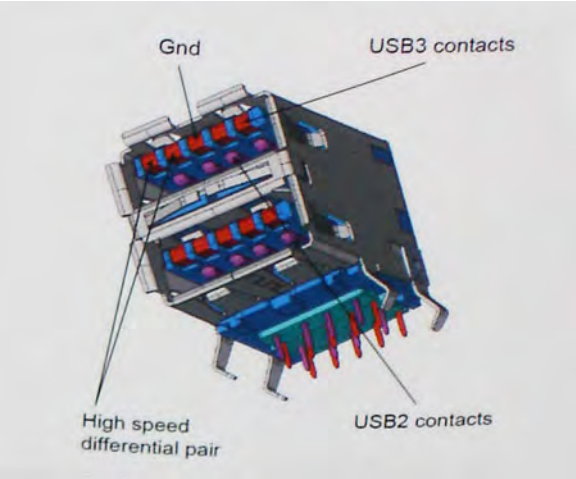
The topics below cover some of the most commonly asked questions regarding USB 3.0/USB 3.1 Gen 1.

Speed

Currently, there are 3 speed modes defined by the latest USB 3.0/USB 3.1 Gen 1 specification. They are Super-Speed, Hi-Speed and Full-Speed. The new SuperSpeed mode has a transfer rate of 4.8Gbps. While the specification retains Hi-Speed, and Full-Speed USB mode, commonly known as USB 2.0 and 1.1 respectively, the slower modes still operate at 480Mbps and 12Mbps respectively and are kept to maintain backward compatibility.

USB 3.0/USB 3.1 Gen 1 achieves the much higher performance by the technical changes below:

- An additional physical bus that is added in parallel with the existing USB 2.0 bus (refer to the picture below).
- USB 2.0 previously had four wires (power, ground, and a pair for differential data); USB 3.0/USB 3.1 Gen 1 adds four more for two pairs of differential signals (receive and transmit) for a combined total of eight connections in the connectors and cabling.
- USB 3.0/USB 3.1 Gen 1 utilizes the bidirectional data interface, rather than USB 2.0's half-duplex arrangement. This gives a 10-fold increase in theoretical bandwidth.



With today's ever increasing demands placed on data transfers with high-definition video content, terabyte storage devices, high megapixel count digital cameras etc., USB 2.0 may not be fast enough. Furthermore, no USB 2.0 connection could ever come close to the 480Mbps theoretical maximum throughput, making data transfer at around 320Mbps (40MB/s) — the actual real-world maximum. Similarly, USB 3.0/USB 3.1 Gen 1 connections will never achieve 4.8Gbps. We will likely see a real-world maximum rate of 400MB/s with overheads. At this speed, USB 3.0/USB 3.1 Gen 1 is a 10x improvement over USB 2.0.

Applications

USB 3.0/USB 3.1 Gen 1 opens up the laneways and provides more headroom for devices to deliver a better overall experience. Where USB video was barely tolerable previously (both from a maximum resolution, latency, and video compression perspective), it's easy to imagine that with 5-10 times the bandwidth available, USB video solutions should work that much better. Single-link DVI requires almost 2Gbps throughput. Where 480Mbps was limiting, 5Gbps is more than promising. With its promised 4.8Gbps speed, the standard will find its way into some products that previously weren't USB territory, like external RAID storage systems.

Listed below are some of the available SuperSpeed USB 3.0/USB 3.1 Gen 1 products:

- External Desktop USB 3.0/USB 3.1 Gen 1 Hard Drives
- Portable USB 3.0/USB 3.1 Gen 1 Hard Drives
- USB 3.0/USB 3.1 Gen 1 Drive Docks & Adapters
- USB 3.0/USB 3.1 Gen 1 Flash Drives & Readers
- USB 3.0/USB 3.1 Gen 1 Solid-state Drives
- USB 3.0/USB 3.1 Gen 1 RAIDs
- Optical Media Drives
- Multimedia Devices
- Networking
- USB 3.0/USB 3.1 Gen 1 Adapter Cards & Hubs

Compatibility

The good news is that USB 3.0/USB 3.1 Gen 1 has been carefully planned from the start to peacefully co-exist with USB 2.0. First of all, while USB 3.0/USB 3.1 Gen 1 specifies new physical connections and thus new cables to take advantage of the higher speed capability of the new protocol, the connector itself remains the same rectangular shape with the four USB 2.0 contacts in the exact same location as before. Five new connections to carry receive and transmitted data independently are present on USB 3.0/USB 3.1 Gen 1 cables and only come into contact when connected to a proper SuperSpeed USB connection.

Windows 8/10 will be bringing native support for USB 3.1 Gen 1 controllers. This is in contrast to previous versions of Windows, which continue to require separate drivers for USB 3.0/USB 3.1 Gen 1 controllers.

Microsoft announced that Windows 7 would have USB 3.1 Gen 1 support, perhaps not on its immediate release, but in a subsequent Service Pack or update. It is not out of the question to think that following a successful release of USB 3.0/USB 3.1 Gen 1 support in Windows 7, SuperSpeed support would trickle down to Vista. Microsoft has confirmed this by stating that most of their partners share the opinion that Vista should also support USB 3.0/USB 3.1 Gen 1.

USB Type-C

USB Type-C is a new, tiny physical connector. The connector itself can support various exciting new USB standards like USB 3.1 and USB power delivery (USB PD).

Alternate Mode

USB Type-C is a new connector standard that is very small. It is about a third the size of an old USB Type-A plug. This is a single connector standard that every device should be able to use. USB Type-C ports can support a variety of different protocols using “alternate modes,” which allows you to have adapters that can output HDMI, VGA, DisplayPort, or other types of connections from that single USB port

USB Power Delivery

The USB PD specification is also closely intertwined with USB Type-C. Currently, smartphones, tablets, and other mobile devices often use a USB connection to charge. A USB 2.0 connection provides up to 2.5 watts of power — that'll charge your phone, but that's about it. A laptop might require up to 60 watts, for example. The USB Power Delivery specification ups this power delivery to 100 watts. It's bi-directional, so a device can either send or receive power. And this power can be transferred at the same time the device is transmitting data across the connection.

This could spell the end of all those proprietary laptop charging cables, with everything charging via a standard USB connection. You could charge your laptop from one of those portable battery packs you charge your smartphones and other portable devices from today. You could plug your laptop into an external display connected to a power cable, and that external display would charge your laptop as you used it as an external display — all via the one little USB Type-C connection. To use this, the device and the cable have to support USB Power Delivery. Just having a USB Type-C connection doesn't necessarily mean they do.

USB Type-C and USB 3.1

USB 3.1 is a new USB standard. USB 3's theoretical bandwidth is 5 Gbps, while USB 3.1's is 10 Gbps. That's double the bandwidth, as fast as a first-generation Thunderbolt connector. USB Type-C isn't the same thing as USB 3.1. USB Type-C is just a connector shape, and the underlying technology could just be USB 2 or USB 3.0. In fact, Nokia's N1 Android tablet uses a USB Type-C connector, but underneath it's all USB 2.0 — not even USB 3.0. However, these technologies are closely related.

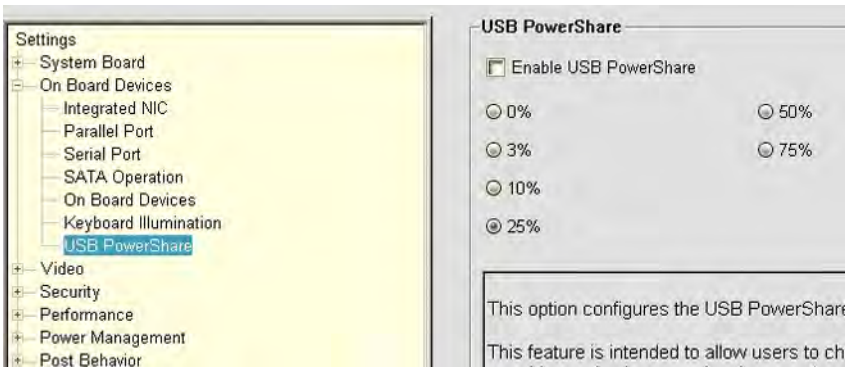
USB Powershare

USB PowerShare is a feature which allows for external USB devices (i.e. cellular phones, portable music players, etc.) to charge using the

portable system's battery.

Only the USB connector with a **lightning bolt icon**, as seen in the image above, can be used.

This functionality is enabled in the system setup under the **On Board Devices** heading. You can select how much of the battery's charge can be used as well (pictured below). If you set the USB PowerShare to 25%, the external device is allowed to charge until the battery reaches 25% of full capacity (e.g. 75% of the portable's battery charge is used up).



Ethernet

The Intel I219LM Jacksonville WGI219LM family of Gigabit Ethernet controllers provides compact, single-port integrated physical layer devices that connect to the Intel Skylake chipsets.

The Intel WGI219LM supports the latest Ethernet security standard known as MACsec3 (IEEE standard 802.1ae). The Intel WGI219LM is the corporate LAN product with support for Intel vPro; technology, Intel AMT2, Energy Efficient Ethernet (802.3az), MACsec (802.1ae), Intel SIPP, iSCSI Boot, Server OS support.

Product Features

General

- 10 BASE-T IEEE 802.3 specification conformance
- 100 BASE-TX IEEE 802.3 specification conformance
- 1000 BASE-T IEEE 802.3 specification conformance
- Energy Efficient Ethernet (EEE)
- IEEE 802.3az support [Low Power Idle (LPI) mode]
- IEEE 802.3u autonegotiation conformance
- Supports carrier extension (half duplex)
- Loopback modes for diagnostics
- Advanced digital baseline wander correction
- Automatic MDI/MDIX crossover at all speeds of operation
- Automatic polarity correction
- MDC/MDIO management interface
- Flexible filters in PHY to reduce integrated LAN controller power
- Smart speed operation for automatic speed reduction on faulty cable plants
- PMA loopback capable (no echo cancel)
- 802.1as/1588 conformance
- Power Optimizer Support
- Intel Stable Image Platform Program (SIPP)
- iSCSI Boot
- Network proxy/ARP Offload support
- Up to 32 programmable filters
- No support for Gb/s half-duplex operation

Security and Manageability

- Intel vPro support with appropriate Intel chipset components

Performance

- Jumbo Frames (up to 9 Kb)
- 802.1Q & 802.1p
- Receive Side Scaling (RSS)
- Two Queues (Tx & Rx)

Power

- Ultra Low Power at cable disconnect (<1 mW) enables platform support for connected standby
- Reduced power consumption during normal operation and power down modes
- Integrated Intel Auto Connect Battery Saver (ACBS)
- Single-pin LAN disable for easier BIOS implementation

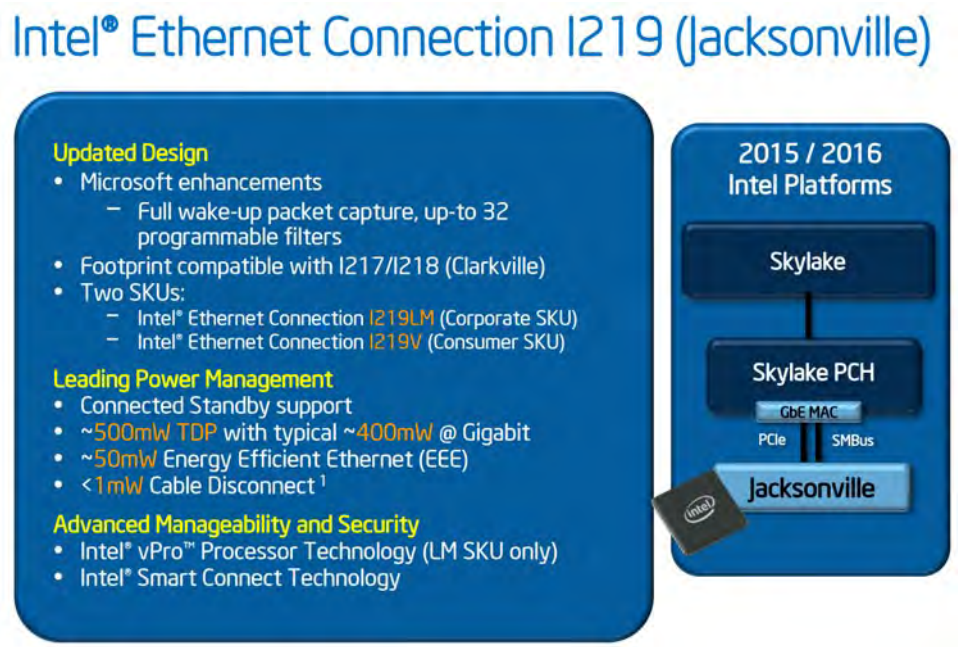
- Fully integrated Switching Voltage Regulator (iSVR)
- Low Power LinkUp(LPLU)

MAC/PHY Interconnect

- PCIe-based interface for active state operation (S0 state)
- SMBus-based interface for host and management traffic (Sx low power state)

Package/Design

- 48-pin package, 6x6mm with a 0.4 mm lead pitch and an Exposed Pad for ground
- Three configurable LED outputs
- Integrated MDI interface termination resistors to reduce BOM costs
- Reduced BOM cost by sharing SPI flash with PCH



Portables Technology Dell Client Configuration Toolkit CCTK

Customers may also report that after a motherboard replacement, the asset field is already populated in the system BIOS, and needs to be cleared or set. For older systems, asset.com can still be used if desired. Asset.com can only be used from outside of the operating system, so a floppy or bootable key or CD will need to be used. For older systems and all newer systems with the UEFI BIOS platform, customers can download the Dell Client Configuration Toolkit(CCTK) to customize the BIOS options or even change the ownership or asset tag from within Windows. Here's how you can use CCTK to add/modify the owner tag or asset tag:

Command Line Interface

1 Launch the Command Prompt(CMD) application using Administrator rights.

2 In the CMD, go to:

- Program Files>Dell>CCTK>X86 (32-bits Windows)

- Program Files>Dell>CCTK>X86_64(64-bits Windows)

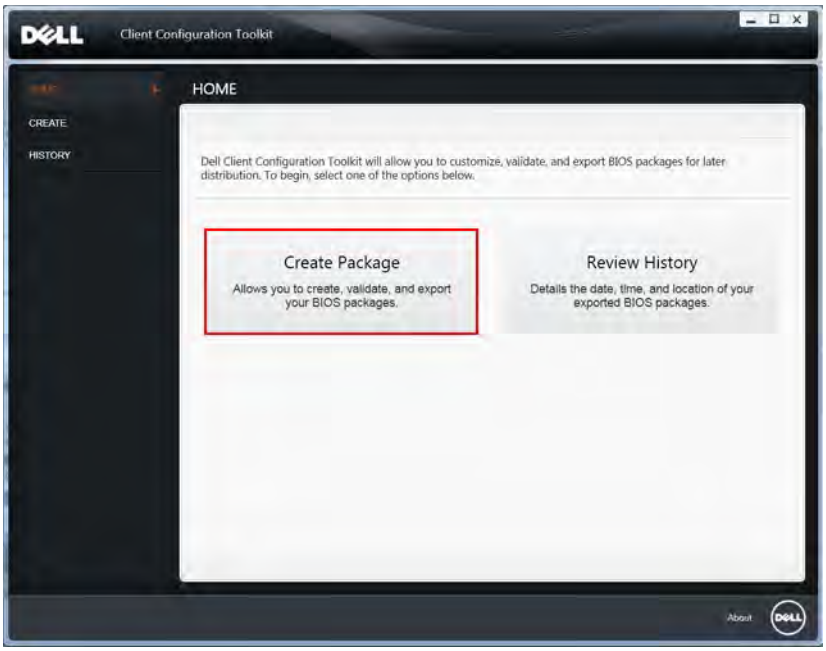
3 To add/modify owner tag, type the command, **CCTK --propowntag=(ownertag)** without the brackets.

4 To add/modify asset tag, type the command, **CCTK --asset=(assettag)** without the brackets

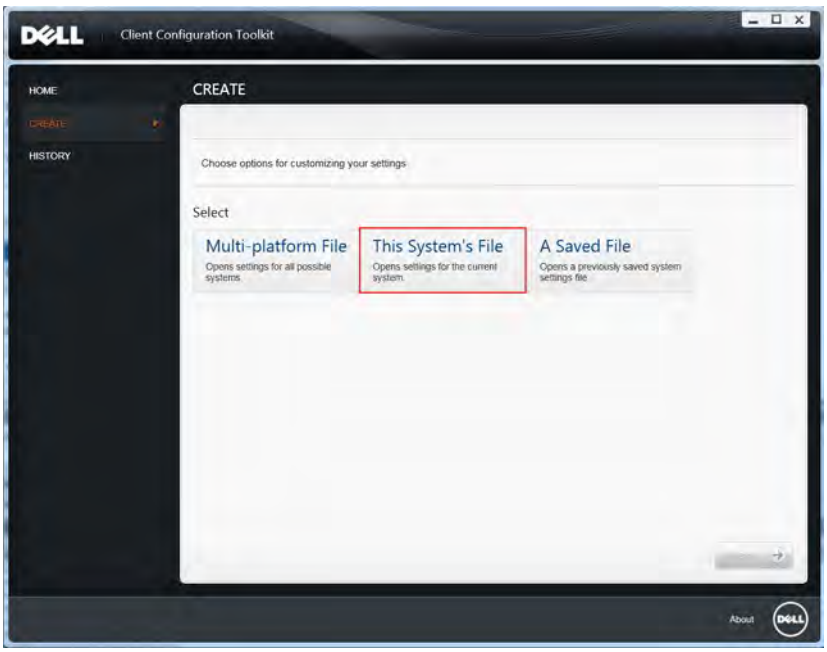
Graphic User Interface

1 Go to **Start** > **Program Files** > **Dell>CCTK** and launch the CCTK Configuration Wizard application.

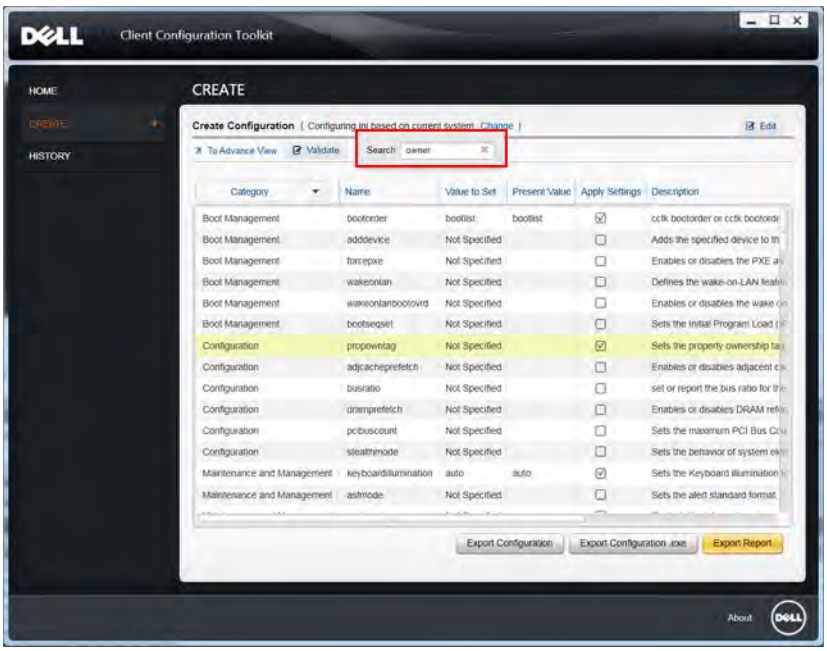
2 Select **Create Package** option.



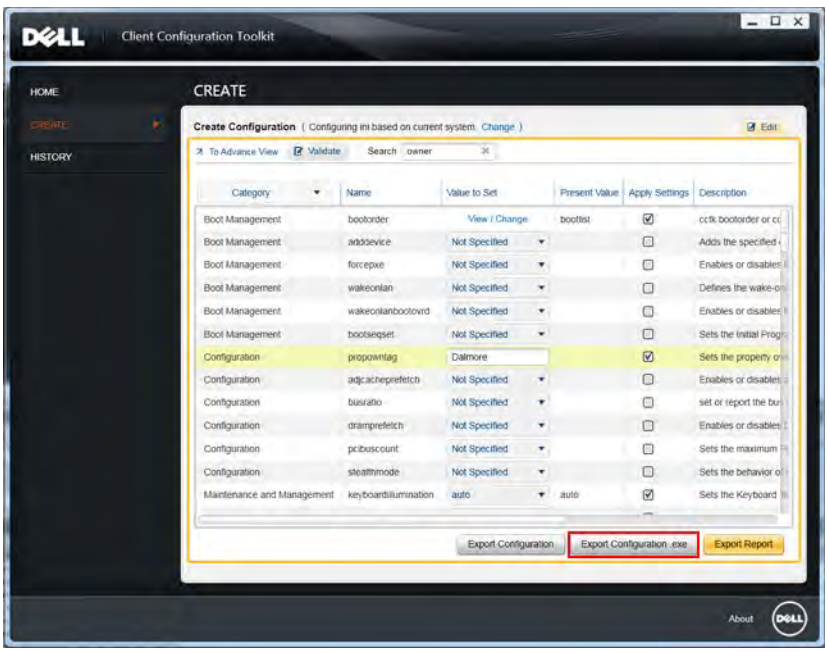
3 Select **This System's File** option and click **Next** button to continue.



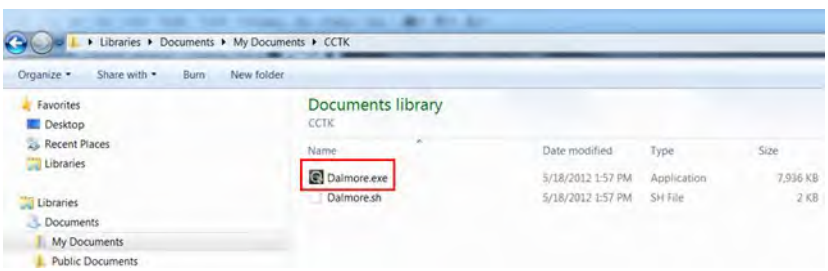
4 Use the Search option to find the **Owner Tag** and **Asset Tag** Option as illustrated below. To add/modify the settings, double click on the selected option or click on the **Edit** button.



5 After the editing process, click on the **Export Configuration.exe** button to create a CCTK application package for the system. If the system is secured with a system password, key in the system password on the next prompt or save the package to any preferred destination folder.



6 Run the saved package file from the destination folder. The package will launch and change the settings seamlessly without any acknowledgment.



Fingerprint Reader

This topic explains the software used in fingerprint reader

The Portables Technology has an integrated fingerprint reader located on the palm rest to the right of the touch pad. The fingerprint reader is an option, so not all systems have it. Included with the driver for the fingerprint reader is a software package from Dell ControlVault, that provides functionality for the device. Dell provides all support for the software, same as on the Latitude systems.

Dell ControlVault Software

The software package for the fingerprint reader is ControlVault by Dell. It provides the following functionality to the fingerprint reader:

- Uses the fingerprint reader for Windows® logon and system start-up password authentication
- Registers websites and Windows applications for password replacement
- Launches a favorite application with a finger swipe
- Stores confidential information in an encrypted folder

To gain any of this functionality, a user must first enroll fingerprints. An easy-to-follow wizard guides the user through the enrollment process. The user can choose to save fingerprints to the hard drive or the fingerprint reader

NOTE: A user should enroll more than one finger's print.

Troubleshooting Touchpad

Most touch pad issues are erratic movement or no movement at all. Since erratic movement is the more common problem, it is covered first.

Erratic Pointer Movement

Here are some easy steps to take to determine the problem with a touch pad demonstrating erratic pointer movement:

1 Get the latest driver from Dell support site - Most problems can be corrected with a simple driver download. This should always be one of the first steps when diagnosing any touch pad problem.

2 Check for hand and finger placement - The most common cause of random pointer movement is that the touch pad senses a finger or part of the hand near the surface of the device.

- Have the customer attempt to use the touch pad normally but to pay attention to the location of his or her hands and fingers. Are any straying too close to the touch pad?
- Adjust the Touch Sensitivity and Touch and check settings in the Touch Pad Settings section of the Dell Touchpad Properties.

3 Try an external mouse - Does this problem happen with an external mouse attached?

- The Device Select section of the Dell Touchpad Properties has options to enable or disable the touch pad or external mouse. Try several combinations of these settings.
- If the problems only occur when the touch pad is enabled and do not occur any time a mouse or other external device is used, then the issue is related to the touch pad.

4 Check for mechanical problems - If the problem cannot be corrected by adjusting the settings mentioned above and only occurs with the touch pad enabled and then this could indicate a mechanical problem.

- Press down on the palm rest on first the left side of the touch pad and then the right. See if the cursor starts moving on its own.

- Run ePSA Diagnostics and try to recreate the problems there. If either of these situations occurs, replace the palm rest.

No Pointer Movement

No pointer movement from the touch pad (or track stick, if available) usually is the result of one of two things: The touch pad has been disabled in the driver interface, or the touch pad cable is damaged or disconnected. Follow the steps below to determine the problem.

1 Connect an external mouse - In either situation, an external mouse should still function. If it does not, try booting into Safe Mode and testing both devices again.

2 Enable the touch pad in the driver settings - Using the external mouse (or key strokes if no mouse is available), go into the Dell Touchpad Properties. Go to the Device Select section and enable the touch pad. If already enabled, get the latest driver from Dell support site.

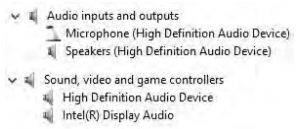
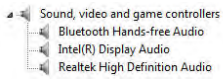
3 Test the device in Dell ePSA Diagnostics - To eliminate a potential software problem, run the Dell ePSA Diagnostics and test the device here.

4 Check for mechanical problems - As a last resort, press down on the palm rest where the touch pad connector is located on the system board. If the pointer reacts in some way, then the cable may just need to be reseated. Otherwise, replace the palm rest.

Realtek HD audio drivers

Verify if the Realtek audio drivers are already installed in the computer.

Table 53. Realtek HD audio drivers

Before installation	After installation
	

Troubleshooting audio issues

This topics details the troubleshooting steps in resolving audio related issues specific to IDT92HD87 audio chip

No Audio

Determine if the problem is only on the internal or external speakers or both.

1 If the problem is external only, try reseating the speakers or headphones. Also try another set of speakers or headphones if available. Check the speaker connector for damage. If the problem does not happen with different speakers, then the problem is related to the external device. If it persists, then there is a problem with either the audio connector or the audio controller. Confirm this by running Dell Diagnostics.

2 If the problem is internal only, try shaking the unit and see if the sound returns or plays intermittently. If it does, then a connection for the speakers is loose and the unit needs service. If there is still no sound at all, then try deleting the hardware profile (if possible) and recreating it. Test the speakers using Dell Diagnostics both internally and externally. If the problem only happens on the internal speakers, then the speakers and possibly the system board need to be replaced.

If there is no audio from either internal or external speakers, then check the following:

1 Adjust the volume controls. Some systems also have an external volume control in addition to the one in the Windows® operating system.

2 Check Device Manager and ensure the audio driver is installed correctly. Any problems indicated here can normally be resolved by reinstalling the audio driver from the ResourceDVD or from dell.com/support.

3 If the audio is installed correctly in Windows but there still is no sound, run Dell Diagnostics on the audio controller. If these fail or no sound is heard, then replace the system board. If audio does play during this test, then the problem is most likely software related.

Poor Sound Quality

1 Determine if the problem is related to a specific application or program. If so, the software may not be fully compatible with the audio controller on the system. Check the software manufacturer´s website for any updates.

2 Update to the latest BIOS and driver from dell.com/support

3 Some problems can be caused by issues with the DirectX® API. Try downloading the latest version from Microsoft.

4 See if the problem occurs on both internal and external speakers. If isolated to only one of the two, follow the troubleshooting mentioned above. Otherwise, run Dell Diagnostics to test the audio.

5 If the problem fails during the audio test, this is a hardware problem and the system needs service. If it does not, then a software problem exists.

Sound from Only One Channel

1 The majority of the time, this problem happens only on external speakers. Reseating the speaker connection usually corrects the problem.

2 Check the volume control in Windows and make sure the balance slider is not set all the way to one side.

3 If this problem is happening only on internal speakers, try shaking the unit to see if sound comes back or if it comes and goes intermittently. If either of these occurs, a loose speaker connection most likely is the problem and the system needs service.

4 If this issue is happening only on external speakers and the previous steps did not help, then examine the audio connector for damage. Test the system with Dell Diagnostics. If the problem persists there, then the audio connector needs to be replaced.

Hard drive options

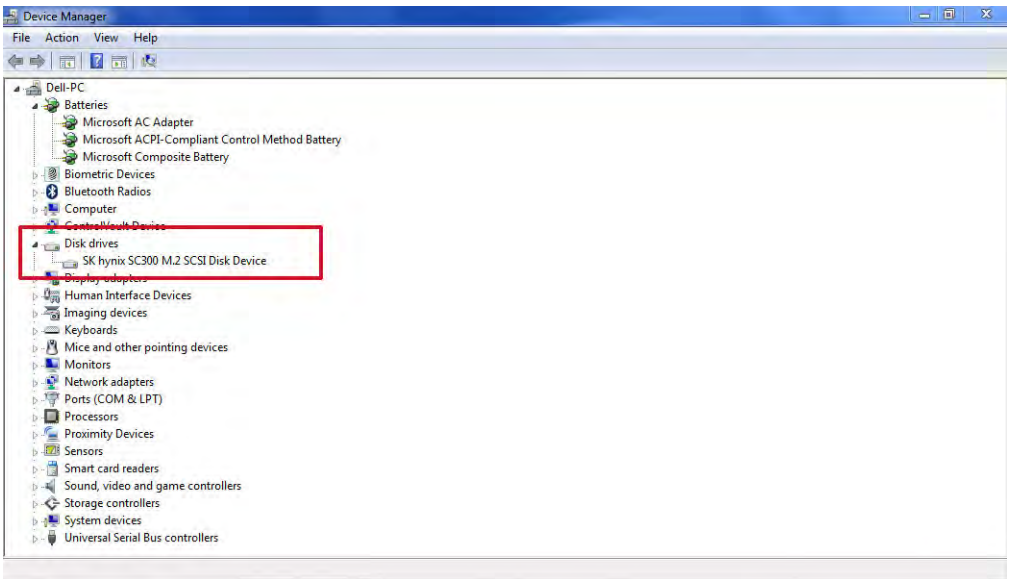
This laptop supports M.2 SATA drives.

Identifying the hard drive in Windows 10

1 Tap or click **All Settings** on the Windows 10 Charms Bar.

2 Tap or click **Control Panel**, select **Device Manager** , and expand **Disk drives**.

The hard drive is listed under **Disk drives**.

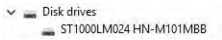


Identifying the hard drive in Windows 7

1 Click **Start** > **Control Panel** > **Device Manager**.

The hard drive is listed under Disk drives.

2 Expand **Disk drives**.



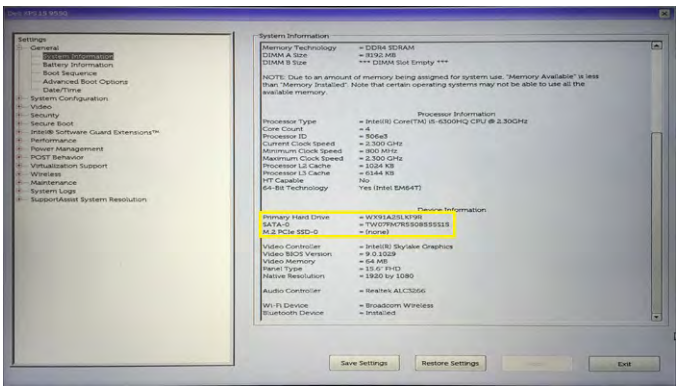
Identifying the hard drive in the BIOS

1 Turn on or restart your system.

2 When the Dell logo appears, perform the following action to enter the BIOS setup program:

- With keyboard — Tap F2 until the Entering BIOS setup message appears. To enter the Boot selection menu, tap F12.

The hard drive is listed under the **System Information** under the **General** group.



Intel Rapid Storage Technology

Overview

Intel® Rapid Storage Technology provides new levels of protection, performance, and expandability for desktop and mobile platforms. Whether using one or multiple hard drives, users can take advantage of enhanced performance and lower power consumption. When using more than one drive, the user can have additional protection against data loss in the event of a hard drive failure.

Intel Rapid Storage Technology was formerly known as Intel® Matrix Storage Manager. Starting with version 9.5, a brand new user interface makes creating and managing your storage simple and intuitive. Combined with Intel Rapid Recover Technology, setting up data protection can be accomplished easily with an external drive.

Valuable digital memories are protected against a hard drive failure when the system is configured for any one of three fault-tolerant RAID levels: RAID 1, RAID 5, and RAID 10. By seamlessly storing copies of data on one or more additional hard drives, any hard drive can fail without data loss or system downtime. When the failed drive is removed and a replacement hard drive is installed, data fault tolerance is easily restored.

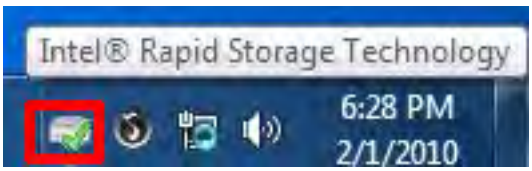
Intel Rapid Storage Technology can also improve the performance of disk intensive retrieval applications such as editing home video. By combining from two to six drives in a RAID 0 configuration, data can be accessed on each drive simultaneously, speeding up response time on data-intensive applications. Also, due to drive load balancing, even systems with RAID 1 can take advantage of faster boot times and data reads.

Intel Rapid Storage Technology provides benefits to users of a single drive as well. Through AHCI, storage performance is improved through Native Command Queuing (NCQ). AHCI also delivers longer battery life with Link Power Management (LPM), which can reduce the power consumption of the chipset and Serial ATA (SATA) hard drive.

Installation Instructions

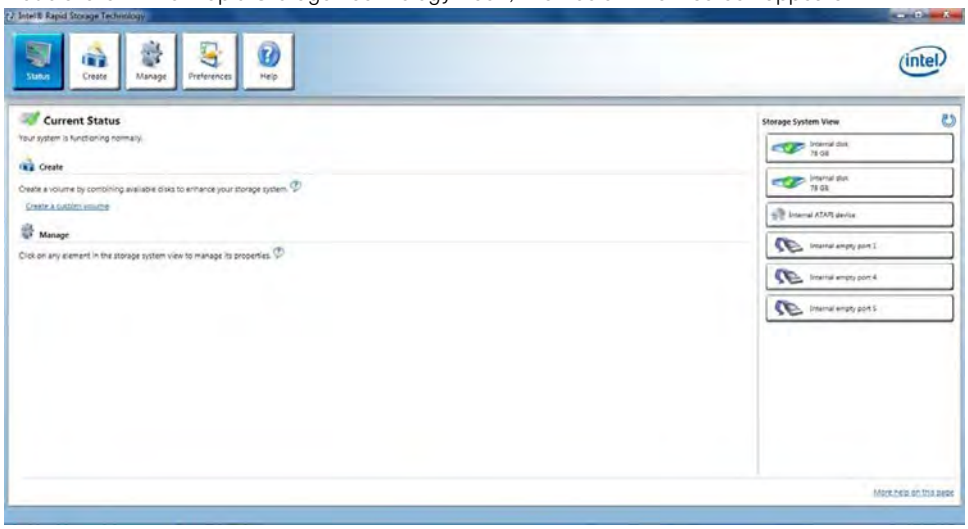
The Intel Rapid Storage Technology software can be install through the Resource DVD provided with the system. When you first launch the installation file, you'll get the first screen as below:

Please remember to check on the "Install Intel® Control Center" otherwise the user graphical interface RAID management software would not be install. Click 'Next' to continue the installation. Once the installation completes, user will get the "Intel Rapid Storage Technology" icon on the Windows task bar:



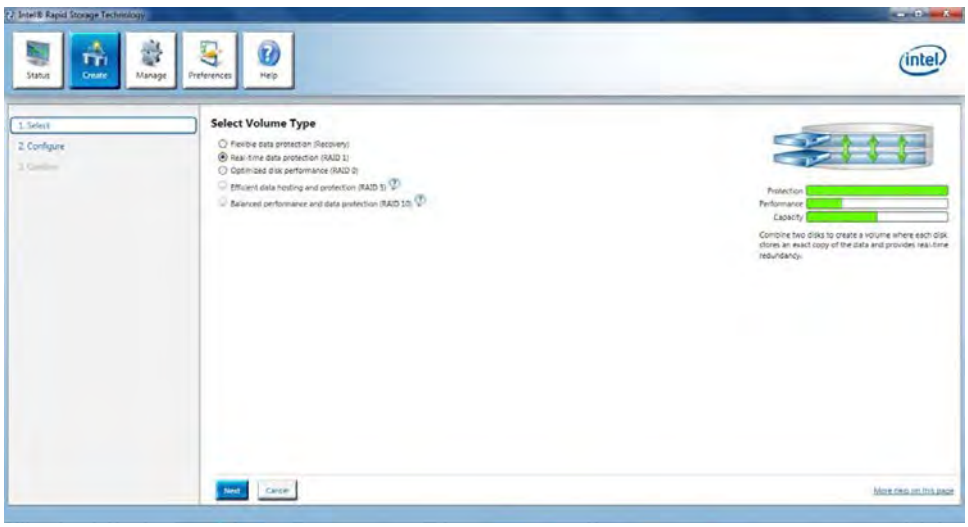
Create a RAID Array

1 Double-click "Intel Rapid Storage Technology" icon, then below main screen appears.

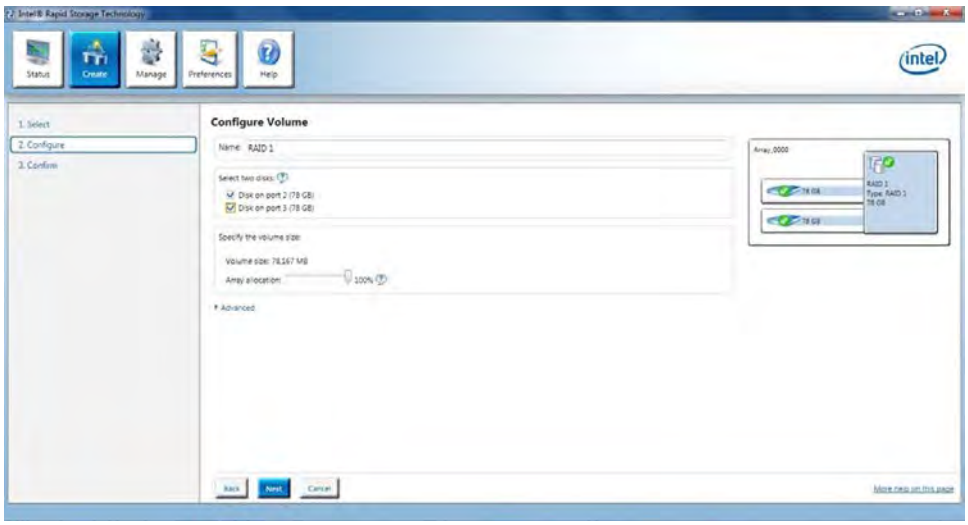


2 Click the "Create" icon to create a RAID array. Here we take RAID 1 for example.

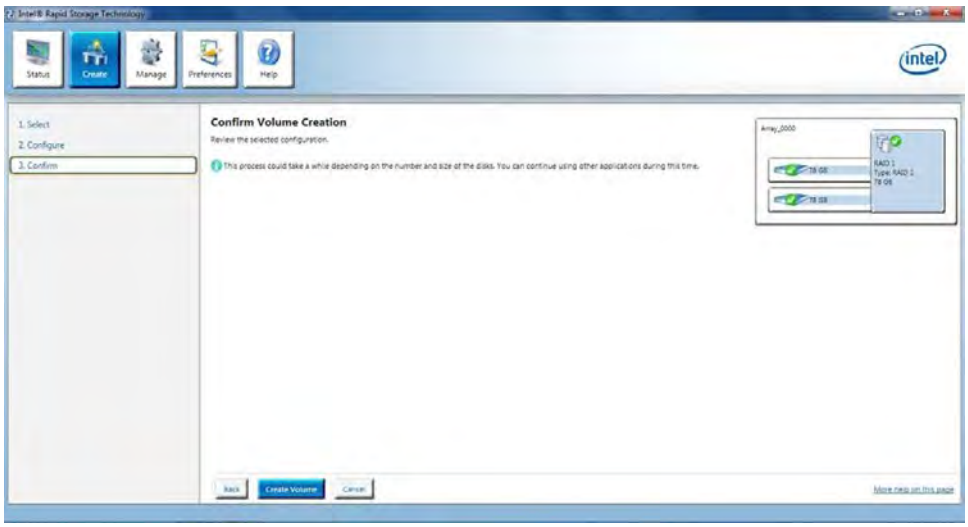
3 In "Select Volume Type", click "Real-time data protection (RAID 1)". Click "Next".



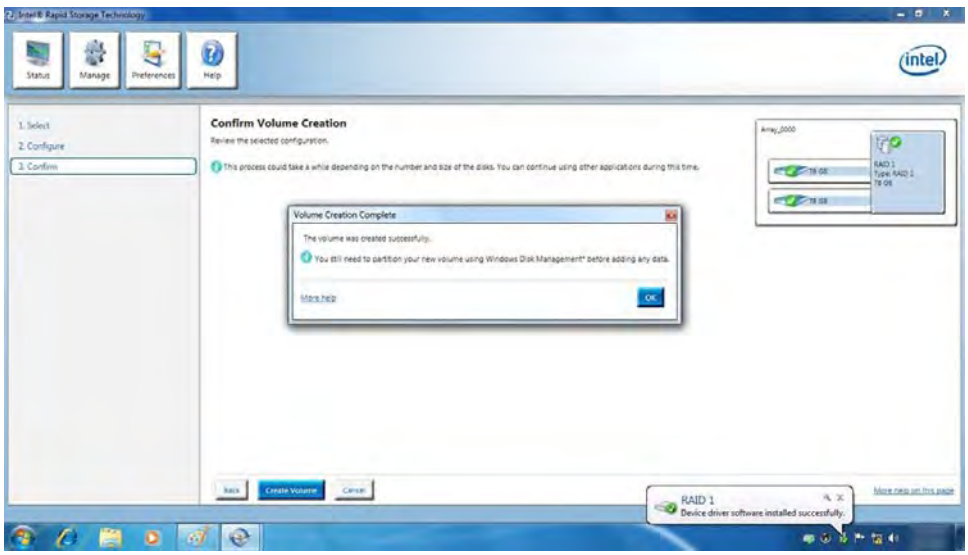
4 In "Configure Volume", you need to key-in the Volume Name with 1-16 letters, select the RAID disks, and then specify the volume size. Click "Next"



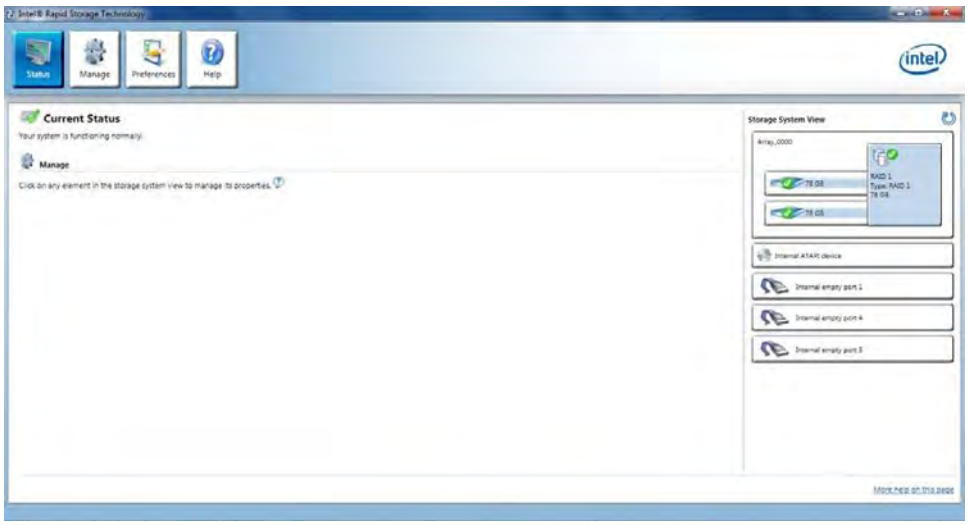
5 In "Confirm Volume Creation", you may review the selected configuration. Then click "Create Volume".



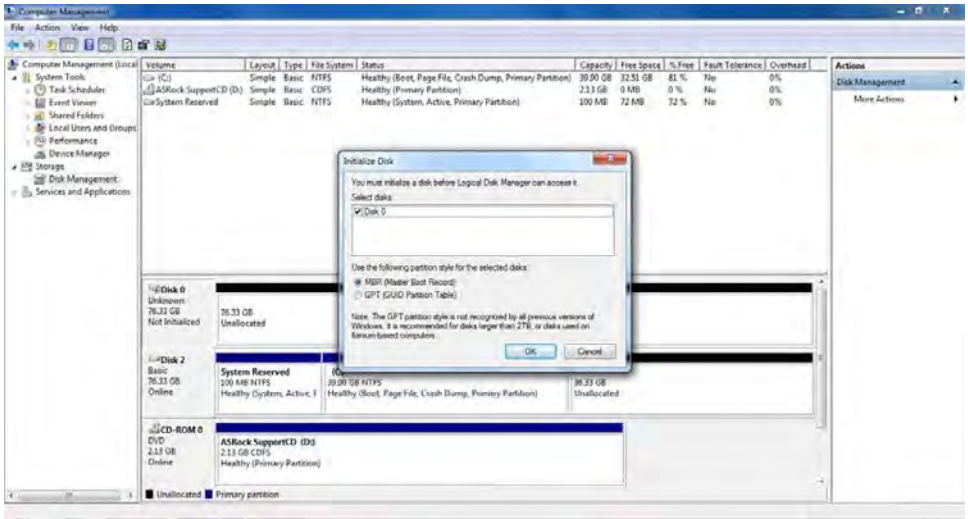
6 The volume is created successfully. But you still need to partition your new volume by using Windows Desk Management before adding any data. Click "OK".



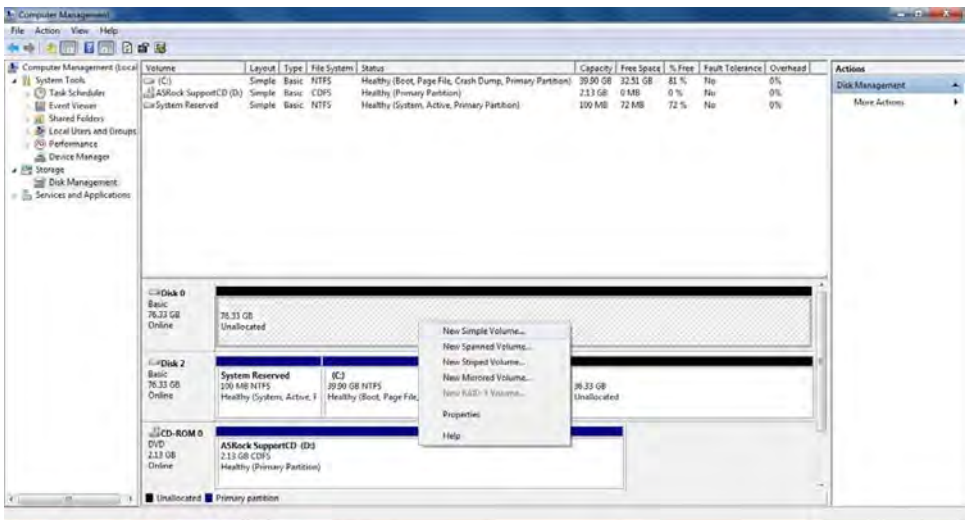
7 You will see the current status.



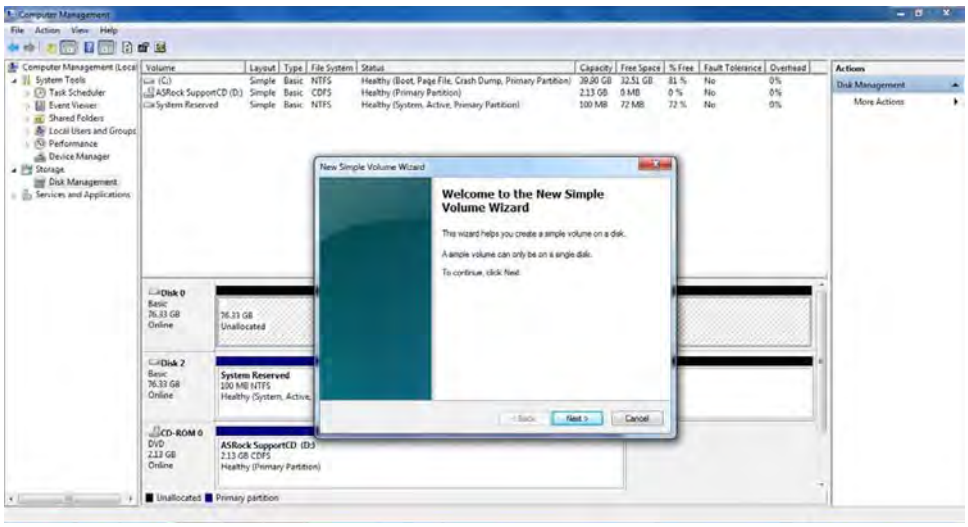
8 In Windows Desk Management, you need to initialize a disk before Logical Disk Management can access it. Click "OK".



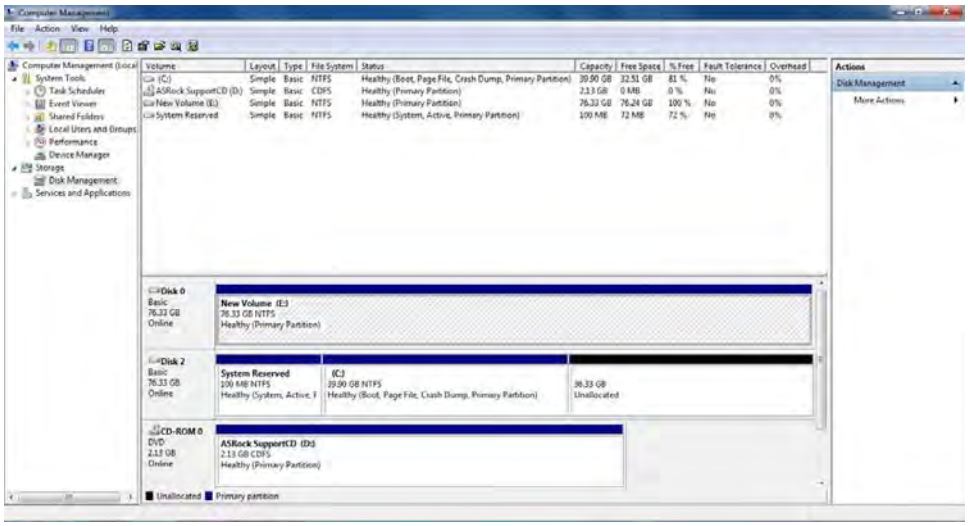
9 Right-click on Disk 0, click "New Simple Volume".



10 Then follow the instructions on the New Simple Volume Wizard.



11 Finally you can start to use RAID 1 function.



Camera features

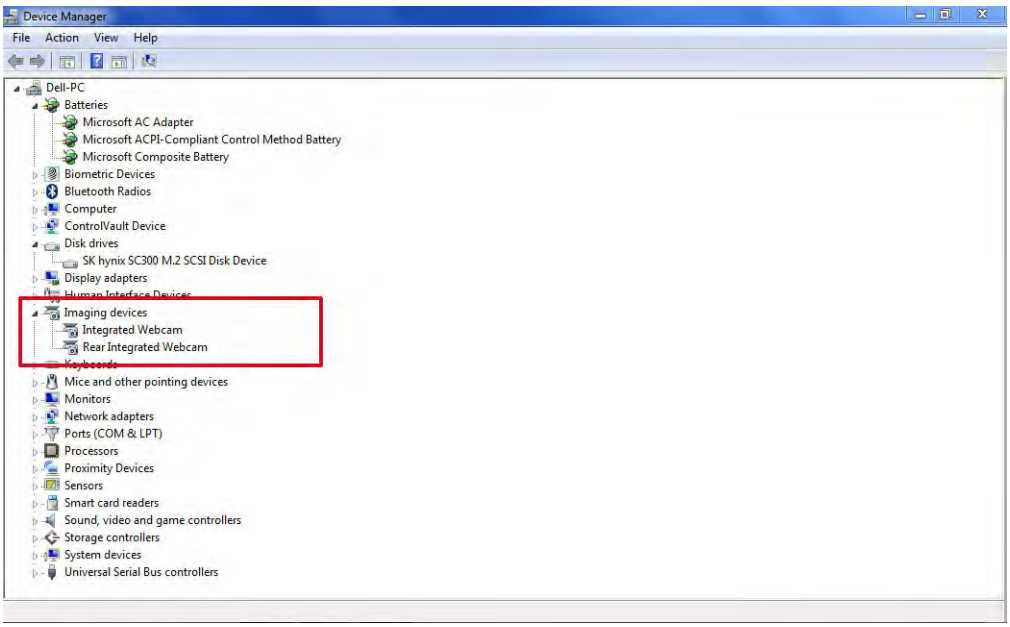
This laptop comes with front-facing camera with the image resolution of 1280 x 720 (maximum).

NOTE: The camera is at the top center of the LCD.

Identifying the camera in Device Manager on Windows 10

1 In the **Search** box, type `device manager`, and tap to start it.

2 Under **Device Manager**, expand **Imaging devices**.



Identifying the camera in Device Manager on Windows 7

1 Click **Start** > **Control Panel** > **Device Manager**.

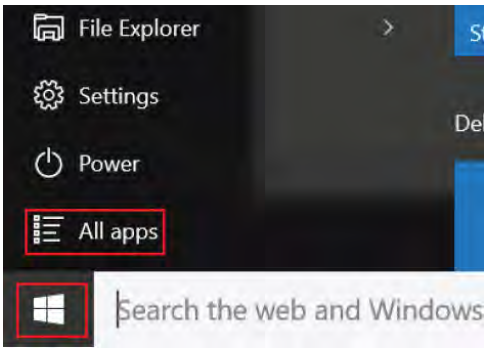
2 Expand **Imaging devices**.

Starting the camera

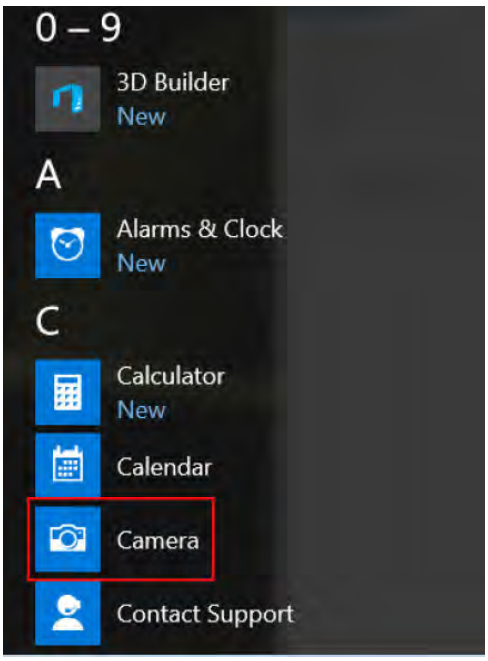
To start the camera, open an application that uses the camera. For instance, if you tap the Skype software that is shipped with the laptop, the camera turns on. Similarly, if you are chatting on the internet and the application requests to access the webcam, the webcam turns on.

Starting the camera application

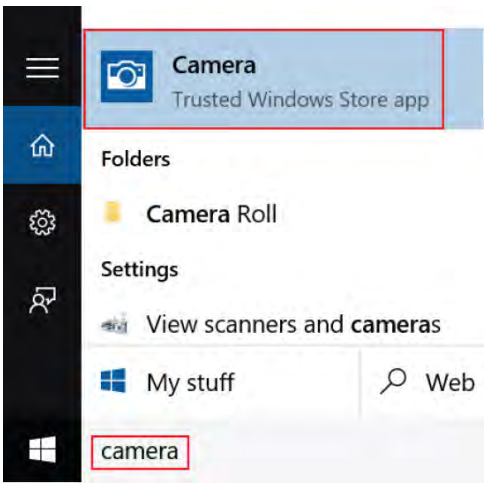
1 Tap or click the **Windows** button and select **All apps**.



2 Select **Camera** from the apps list.



3 If the **Camera** App is not available in the apps list, search for it.



Systems management - From on-premises to the cloud

Dell Client Command Suite - a free toolkit available for download, for all OptiPlex and Latitude PCs at https://dell.com/command, automates and streamlines systems management tasks, saving time, money, and resources. It consists of the following modules that can be used independently, or with a variety of systems management consoles such as SCCM.

Dell Command | Deploy enables easy operating system (OS) deployment across all major OS deployment methodologies and provides numerous system-specific drivers that have been extracted and reduced to an OS-consumable state.

Dell Command I Configure is a graphical user interface (GUI) admin tool for configuring and deploying hardware settings in a pre-OS or post-OS environment, and it operates seamlessly with SCCM and Airwatch and can be self-integrated into LANDesk and KACE. Simply, this is all about the BIOS. Command I Configure allows you to remotely automate and configure over 150+ BIOS settings for a personalized user experience.

Dell Command | PowerShell Provider can do the same things as Command | Configure, but with a different method. PowerShell is a scripting language that allows customers to create a customized and dynamic configuration process.

Dell Command | Monitor is a Windows Management Instrumentation (WMI) agent that provides IT admins with an extensive inventory of the hardware and health-state data. Admins can also configure hardware remotely by using command line and scripting.

Dell Command | Update (end-user tool) is factory-installed and allows admins to individually manage and automatically present and install Dell updates to the BIOS, drivers, and software. Command | Update eliminates the time-consuming hunting and pecking process of update installation.

Dell Command | Update Catalog provides searchable metadata that allows the management console to retrieve the latest system-specific updates (driver, firmware or BIOS). The updates are then delivered seamlessly to end-users using the customer's systems management infrastructure that is consuming the catalog (like SCCM).

Dell Command | vPro Out of Band console extends hardware management to systems that are offline or have an un-reachable OS (Dell exclusive features).

Dell Command | Integration Suite for System Center - This suite integrates all the key components of the Client Command Suite into Microsoft System Center Configuration Manager 2012 and Current Branch versions.

Dell Client Command Suite's integration with VMware Workspace ONE Powered by AirWatch, now allows customers to manage their Dell client hardware from the cloud, using a single Workspace ONE console.

Out-of-Band Systems Management- Intel vPro and Intel Standard Manageability

Intel vPro and Intel Standard Manageability must be configured in the Dell factory at the time of purchase, as they are NOT field ungradable. They offer out-of-band management and DASH compliance.

Intel vPro

Available with Intel Core i5 and i7 processors and offers the most complete set of out-of-band management features including KVM, IPv6 support, graceful shutdown, and all the features from previous versions of vPro. It uses the latest version of Intel's Active Management Technology (AMT).

To learn more about vPro, visit Intel's website at https://www.intel.com/content/www/us/en/architecture-and-technology/vpro/vpro-platform-general.html.

A unique and new Dell Remote Provisioning feature for Intel vPro quickly activates vPro capabilities on a PC, reducing vPro set-up time from months to less than an hour. The Dell Remote Provisioning feature for Intel vPro is available as a part of the module: **Dell Command | Integration Suite for Systems Center**

Intel Standard Manageability (ISM)

ISM offers a limited set of out-of-band features like remote power on/off, Serial-over-LAN redirect, Wake-on-LAN, etc.

To learn more about Intel ISM, visit Intel's website at: https://software.intel.com/en-us/blogs/2009/03/27/what-is-standard-manageability.

UEFI BIOS

UEFI is an acronym for Unified Extensible Firmware Interface. The UEFI specification defines a new model for the interface between personal computer operating systems and platform firmware. The interface consists of data tables that contain platform related information, plus boot and runtime service calls that are available to the operating system and its loader. Together, these provide a standard

environment for booting an operating system and running pre-boot applications. One of the main differences between BIOS and UEFI is the way applications are coded. Assembler was used if functions or applications had to be coded for the BIOS while a higher level language code will be used to program the UEFI.

Dell UEFI BIOS implementation will supersede the existing two different sets of BIOS in the portables and desktop products into one single UEFI BIOS moving forward. For more info about UEFI, see www.uefi.org

Important Information

There is no difference in between the conventional BIOS and the UEFI BIOS unless the UEFI option is checked in the 'Boot List Option' setting in the BIOS page. This will allow the user to create a UEFI boot option list manually without affecting the existing boot priority list. With the implementation of UEFI BIOS, the changes are more related to the manufacturing tools and functionalities with very minimal impact to the customer's usages.

Few things to remember are:

- If customers have a UEFI boot media and ONLY if they have UEFI boot media (either in the optical media or via USB storage), the one-time boot menu will show an additional section listing the UEFI boot options. If they don't have UEFI boot media attached, they will never see this option. Almost all will never get to see this option unless the UEFI boot option is specified manually through the 'Boot Sequence' settings.
- How to change Service Tag/Owner Tag?

  When the service technician replaces a system board, he's required to set the service tag upon the system starts up at one time off basis. Failure to set a service tag may result system battery not being able to charge. Therefore, it is very important that the service technician set the correct system service tag. If a wrong service tag is set, there's no way to reset it and the technician will have to place order for another system board replacement.
- How to change Asset tag information?

  To change the Asset tag information, we can use one of the following software utilities.

  – Dell Client Configuration Toolkit (CCTK)
  – Plat tag

Turning off your computer

Turning off your — Windows

CAUTION: To avoid losing data, save and close all open files and exit all open programs before you turn off your computer .

1 Click or tap  .

2 Click or tap ⏻ and then click or tap **Shut down**.

NOTE: Ensure that the computer and all attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your operating system, press and hold the power button for about 6 seconds to turn them off.

Turning off your computer — Windows 7

CAUTION: To avoid losing data, save and close all open files and exit all open programs before you turn off your computer.

1 Click **Start**.

2 Click **Shut Down**.

NOTE: Ensure that the computer and all attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your operating system, press and hold the power button for about 6 seconds to turn them off.

5

Field Service Information

This chapter details the safety precautions that must be taken before disassembling the systems. It also lists the detailed disassembly and assembly instructions along with related information such as screw list and tool requirements.

Topics:

Safety instructions

Use the following safety guidelines to protect your computer from potential damage and to ensure your personal safety. Unless otherwise noted, each procedure included in this document assumes that the following conditions exist:

- You have read the safety information that shipped with your computer.
- A component can be replaced or, if purchased separately, installed by performing the removal procedure in reverse order.

WARNING: Disconnect all power sources before opening the computer cover or panels. After you finish working inside the computer, replace all covers, panels, and screws before connecting to the power source.

WARNING: Before working inside your computer, read the safety information that shipped with your computer. For additional safety best practices information, see the Regulatory Compliance Homepage

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

CAUTION: To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface at the same time as touching a connector on the back of the computer.

CAUTION: Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a processor by its edges, not by its pins.

CAUTION: When you disconnect a cable, pull on its connector or on its pull-tab, not on the cable itself. Some cables have connectors with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before you disconnect the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, ensure that both connectors are correctly oriented and aligned.

NOTE: The color of your computer and certain components may appear differently than shown in this document.

Before working inside your computer

1 Ensure that your work surface is flat and clean to prevent the computer cover from being scratched.
2 Turn off your computer.
3 If the computer is connected to a docking device (docked), undock it.
4 Disconnect all network cables from the computer (if available).

CAUTION: If your computer has an RJ45 port, disconnect the network cable by first unplugging the cable from your computer.

5 Disconnect your computer and all attached devices from their electrical outlets.

6 Open the display.

7 Press and hold the power button for few seconds, to ground the system board.

CAUTION: To guard against electrical shock unplug your computer from the electrical outlet before performing Step # 8.

CAUTION: To avoid electrostatic discharge, ground yourself by using a wrist grounding strap or by periodically touching an unpainted metal surface at the same time as touching a connector on the back of the computer.

8 Remove any installed ExpressCards or Smart Cards from the appropriate slots.

Safety Precautions

Follow the safety precautions described in the following sections when you perform an installation or a disassembly/reassembly procedure:

- Turn off the system and all attached peripherals.
- Disconnect the system and all attached peripherals from AC power, and then remove the battery.
- Disconnect all network cables, telephone or telecommunications lines from the system.
- Use a wrist grounding strap and mat when working inside any computer system to avoid electrostatic discharge (ESD) damage.
- After removing a system component, carefully place the removed component on an anti-static mat.
- Wear shoes with non-conductive rubber soles to help reduce the risk of being shocked or seriously injured in an electrical accident.

Standby Power

Dell products with standby power must be completely unplugged before the case is opened. Systems that incorporate standby power are essentially powered while turned off. The internal power enables the system to be remotely turned on (wake on LAN), suspended into a sleep mode, and have other advanced power management features.

After you unplug a system and before you remove components, wait approximately 30 to 45 seconds to allow the charge to drain from the circuits.

Bonding

Bonding is a method for connecting two or more grounding conductors to the same electrical potential. This is done through the use of a Field Service ESD kit. When connecting a bonding wire, always ensure that it is connected to bare metal and never to a painted or non-metal surface. The wrist strap should be secure and in full contact with your skin, and be sure to always remove all jewelry such as watches, bracelets, or rings prior to bonding yourself and the equipment.

Figure 8. Bonding Properly

Electrostatic Discharge Protection

ESD is a major concern when you handle electronic components, especially sensitive components such as expansion cards, processors, memory DIMMs, and system boards. Very slight charges can damage circuits in ways that may not be obvious, such as intermittent problems or a shortened product life span. As the industry pushes for lower power requirements and increased density, ESD protection is an increasing concern.

Due to the increased density of semiconductors used in recent Dell products, the sensitivity to static damage is now higher than in earlier Dell products. For this reason some previously approved methods of handling parts are no longer applicable.

There are two recognized types of ESD damage: catastrophic and intermittent failures.

- **Catastrophic** —The damage causes an immediate and complete loss of device functionality. An example of catastrophic failure is a memory DIMM that has received a static shock and immediately generates a "No POST/No Video" symptom with a beep code emitted for missing or nonfunctional memory.

  NOTE: Catastrophic failures represent approximately 20 percent of ESD-related failures.

- **Intermittent** —The DIMM receives a static shock, but the tracing is merely weakened and does not immediately produce outward symptoms related to the damage. The weakened trace may take weeks or months to melt, and in the meantime may cause degradation of memory integrity, intermittent memory errors, etc.

  NOTE: Intermittent failures represent approximately 80 percent of ESD-related failures. The high rate of intermittent failures means that most of the time when damage occurs, it is not immediately recognizable.

The more difficult type of damage to recognize and troubleshoot is the intermittent (also called latent or “walking wounded”) failure. The following image shows an example of intermittent damage to a memory DIMM trace. Although the damage is done, the symptoms may not become an issue or cause permanent failure symptoms for some time after the damage occurs.

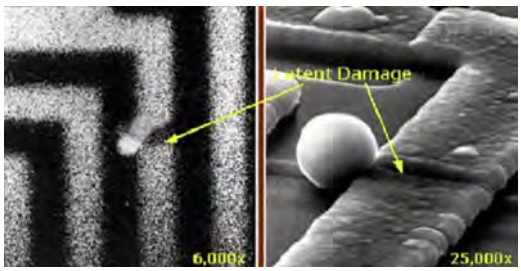


Figure 9. Intermittent (Latent) Damage to a Wiring Trace

Do the following to prevent ESD damage:

- Use a wired ESD wrist strap that is properly grounded.
  The use of wireless anti-static straps is no longer allowed; they do not provide adequate protection.

  Touching the chassis before handling parts does not ensure adequate ESD protection on parts with increased sensitivity to ESD damage.

Figure 10. Chassis "Bare Metal" Grounding (Unacceptable)

- Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and workbench pads.
- When handling static-sensitive components, grasp them by the sides, not the top. Avoid touching pins and circuit boards.
- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the anti-static packing material until you are ready to install the component. Before unwrapping the anti-static packaging, be sure to discharge static electricity from your body.
- Before transporting a static-sensitive component, place it in an anti-static container or packaging.

The ESD Field Service Kit

The unmonitored Field Service kit is the most commonly used. Each Field Service kit includes three main components: anti-static mat, wrist strap, and bonding wire.

Figure 11. ESD Field Service Kit

The anti-static mat is dissipative and should be used to safely place parts on during service procedures. When using an anti-static mat, your wrist strap should be snug and the bonding wire should be connected to the mat and to bare-metal on the system being worked on. Once deployed properly, service parts can be removed from the ESD bag and placed directly on the mat. Remember, the only safe place for ESD-sensitive items are in your hand, on the ESD mat, in the system, or inside a bag.

Figure 12. Anti-Static Mat

The wrist strap and bonding wire can be either directly connected between your wrist and bare metal on the hardware if the ESD mat is not required, or connected to the anti-static mat to protect hardware that is temporarily placed on the mat. The physical connection of the wrist strap and bonding wire between your skin, the ESD mat, and the hardware is known as bonding. Use only Field Service kits with a wrist strap, mat, and bonding wire. Never use wireless wrist straps.

Always be aware that the internal wires of a wrist strap are prone to damage from normal wear and tear, and must be checked regularly with a wrist strap tester in order to avoid accidental ESD hardware damage. It is recommended to test the wrist strap and bonding wire a minimum of once per week.

Table 54. Wrist Straps

Wrist Strap and Bonding Wire	Wireless ESD Strap (Unacceptable)
	

ESD Wrist Strap Tester

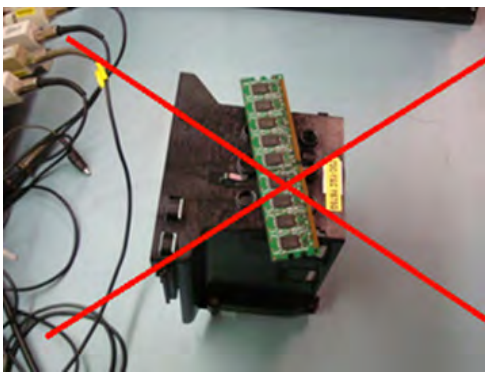
The wires inside of an ESD strap are prone to damage over time. When using an unmonitored kit, it is best practice to regularly test the strap prior to each service call, and at a minimum, test once per week. A wrist strap tester is the best method for doing this test. If you do not have your own wrist strap tester, check with your regional office to find out if they have one. To perform the test, plug the wrist-strap's bonding-wire into the tester while it is strapped to your wrist and push the button to test. A green LED is lit if the test is successful; a red LED is lit and an alarm sounds if the test fails.

Figure 13. Wrist Strap Tester

Insulator Elements

It is critical to keep ESD sensitive devices, such as plastic heat sink casings, away from internal parts that are insulators and often highly charged.

Table 55. Placement of Insulator Elements

Unacceptable — DIMM lying on an insulator part (plastic heat sink shroud)	Acceptable — DIMM separated from the insulator part
	

Consider the Working Environment

Before deploying the ESD Field Service kit, assess the situation at the customer location. For example, deploying the kit for a server environment is different than for a desktop or portable environment. Servers are typically installed in a rack within a data center; desktops or portables are typically placed on office desks or cubicles.

Always look for a large open flat work area that is free of clutter and large enough to deploy the ESD kit with additional space to accommodate the type of system that is being repaired. The workspace should also be free of insulators that can cause an ESD event. On the work area, insulators such as Styrofoam and other plastics should always be moved at least 12 inches or 30 centimeters away from sensitive parts before physically handling any hardware components.

ESD Packaging

All ESD-sensitive devices must be shipped and received in static-safe packaging. Metal, static-shielded bags are preferred. However, you should always return the damaged part using the same ESD bag and packaging that the new part arrived in. The ESD bag should be folded over and taped shut and all the same foam packing material should be used in the original box that the new part arrived in.

ESD-sensitive devices should be removed from packaging only at an ESD-protected work surface, and parts should never be placed on top of the ESD bag because only the inside of the bag is shielded. Always place parts in your hand, on the ESD mat, in the system, or inside an anti-static bag.

Figure 14. ESD Packaging

Transporting Sensitive Components

When transporting ESD-sensitive components such as replacement parts or parts to be returned to Dell, it is critical to place these parts in anti-static bags for safe transport.

ESD Protection Summary

It is strongly suggested that all field service engineers use the traditional wired ESD grounding wrist strap and protective anti-static mat at all times when servicing Dell products. In addition, it is critical that engineers keep sensitive parts separate from all insulator parts while performing service and that they use anti-static bags for transporting sensitive components.

Lifting Equipment

⚠ **WARNING: Do not lift greater than 50 pounds. Always obtain assistance from another person or persons, or use a mechanical lifting device.**

Adhere to the following guidelines when lifting equipment:

1 Get a firm balanced footing. Keep your feet apart for a stable base, and point your toes out.

2 Bend your knees. Do not bend at the waist.
3 Tighten stomach muscles. Abdominal muscles support your spine when you lift, offsetting the force of the load.
4 Lift with your legs, not your back.
5 Keep the load close. The closer it is to your spine, the less force it exerts on your back.
6 Keep your back upright, whether lifting or setting down the load. Do not add the weight of your body to the load. Avoid twisting your body and back.
7 Follow the same techniques in reverse to set the load down.

After working inside your computer

After you complete any replacement procedure, ensure that you connect external devices, cards, and cables before turning on your computer.

CAUTION: To avoid damage to the computer, use only the battery designed for this particular Dell computer. Do not use batteries designed for other Dell computers.

1 Connect any external devices, such as a port replicator or media base, and replace any cards, such as an ExpressCard.
2 Connect any telephone or network cables to your computer.

CAUTION: To connect a network cable, first plug the cable into the network device and then plug it into the computer.

3 Connect your computer and all attached devices to their electrical outlets.
4 Turn on your computer.

Recommended tools

The procedures in this document require the following tools:

- Phillips #0 screwdriver
- Phillips #1 screwdriver
- Plastic scribe
- 5.5 mm Socket wrench
- A pair of tweezers

NOTE: The #0 screw driver is for screws 0-1 and the #1 screw driver is for screws 2-4.

Disassembly and reassembly

Stylus

Removing the stylus.

Installing the stylus.

SD Card

Installing the SD Card

Removing the SD Card

Handle

Removing the Handle

1 Follow the procedure in Before working inside your computer.

2 Loosen the 2 M3.5*7 screws [1].

3 Lift the handle away from the system to complete the removal [2].

Installing the Handle

1 To install the handle place the handle on the screw post. [1]

2 Tighten the 2 M3.5*7 screws. [2]

3 Follow the procedure in After working inside your computer.

Secondary SSD

Removing the Secondary SSD

1 Follow the procedure in Before working inside your computer.

2 To remove the SSD:

a Open the Right bottom I/O door

3 Release the SSD by sliding the blue hard drive release latch left [1].

4 Slide the SSD out of the computer by using the pull tab. [2]

Installing the Secondary SSD

1 Insert the primary SSD sled in to the computer.

2 Push the SSD sled until it clicks in it's place. [1]

3 Install the :

   a Close the Right I/O Door [2]

4 Follow the procedure in After working inside your computer.

Primary SSD

Removing the Primary SSD

1 Follow the procedure in Before working inside your computer.

2 To remove the SSD:

   a Open the Right top I/O door

3 Release the SSD by sliding the blue hard drive release latch left [1].

4 Slide the SSD out of the computer by using the pull tab. [2]

Installing the Primary SSD

1 Insert the primary SSD sled in to the computer.

2 Push the SSD sled until it clicks in it's place. [2]

3 Install the :

a Close the Right I/O Door

4 Follow the procedure in After working inside your computer.

SSD Sled

Removing the SSD from Sled

1 Follow the procedure in Before working inside your computer.

2 Remove the:

a Batteries.

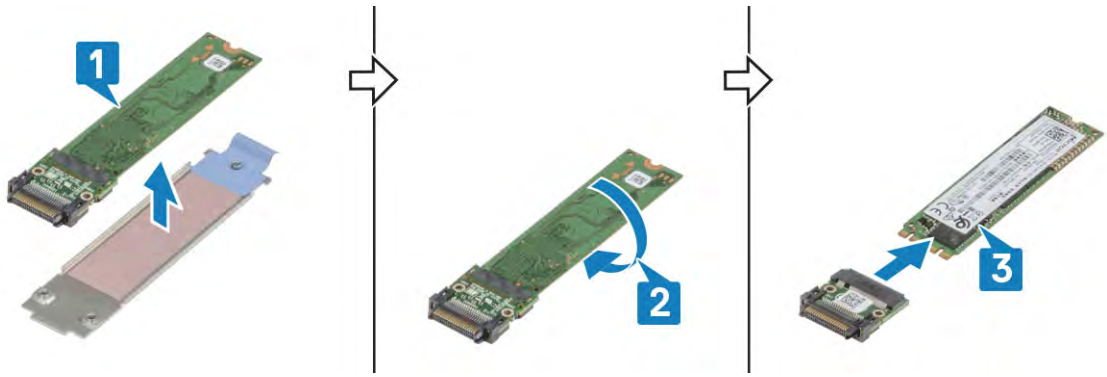
b SSD(Primary or Secondary).

3 Loosen the two, M2*5 screws [1] and flip over. [2]

4 Loosen another one M2*5 screw. [3]

5 Lift the metallic bracket from the sled tray. [4]

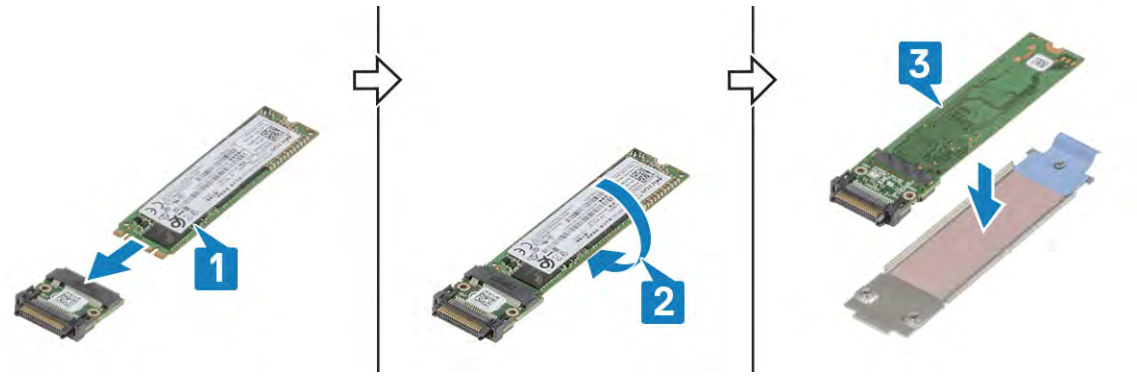
6 Separate the SSD and interposer from the sled tray and thermal pad [1] and flip over. [2]



7 Separate the interposer from the SSD. [3]

Installing the SSD in Sled

1 Connect the SSD to the interposer. [1] and flip over [2]



2 Install the SSD with interposer on the SSD sled tray preassembled with fresh thermal pad. [3]

3 Install the cover [1]:

4 Tighten the one M2*5 screw [2] and flip over [3].

5 Tighten the two M2*5 screws. [4]

6 Install the:

a SSD(Primary or Secondary).

b Batteries

7 Follow the procedure in After working inside your computer.

Latch Doors

Removing the latch doors

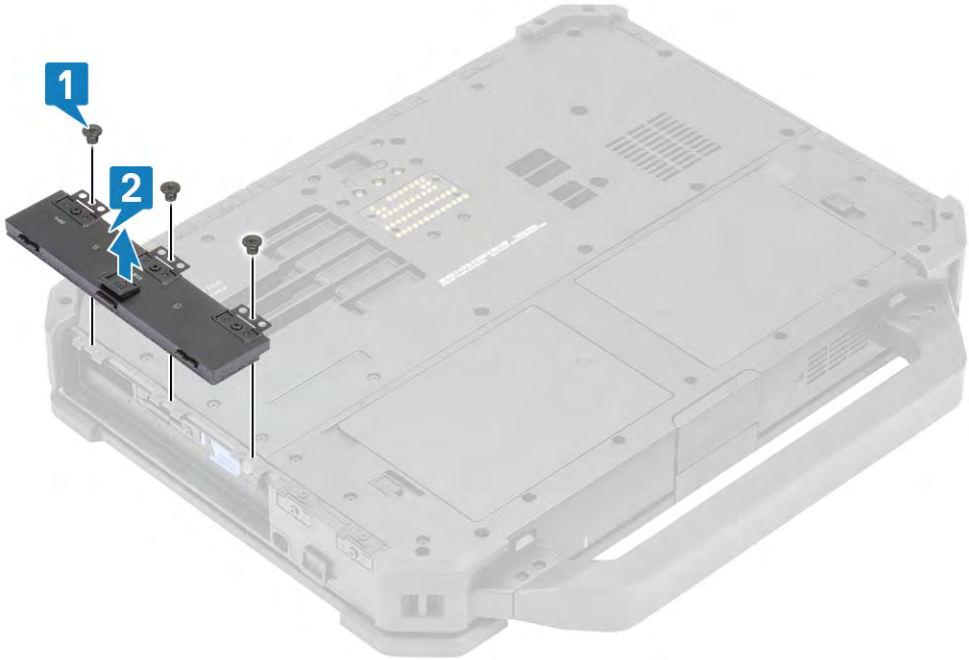
1 Follow the procedure in Before working inside your computer.

2 Loosen the screws securing the hinges to chassis: [1]

Each door depending on its location is secured by one, two or three screws.

Location	No. of Doors	Screws
Left	2	2x M3*3 Screws
		1x M3*3 Screw
Right	2	2x M3*3 Screws
		3x M3*3 Screws
Rear	3	2x M3*3 Screws

Location	No. of Doors	Screws
		2x M3*3 Screws 1x M3*3 Screw



3 Open and remove the I/ O door from the system [2].

Installing the latch doors

1 Align the door in its respective closing position.
2 Latch the I/O door.

3 Tighten the screw securing the hinges to chassis. [2]

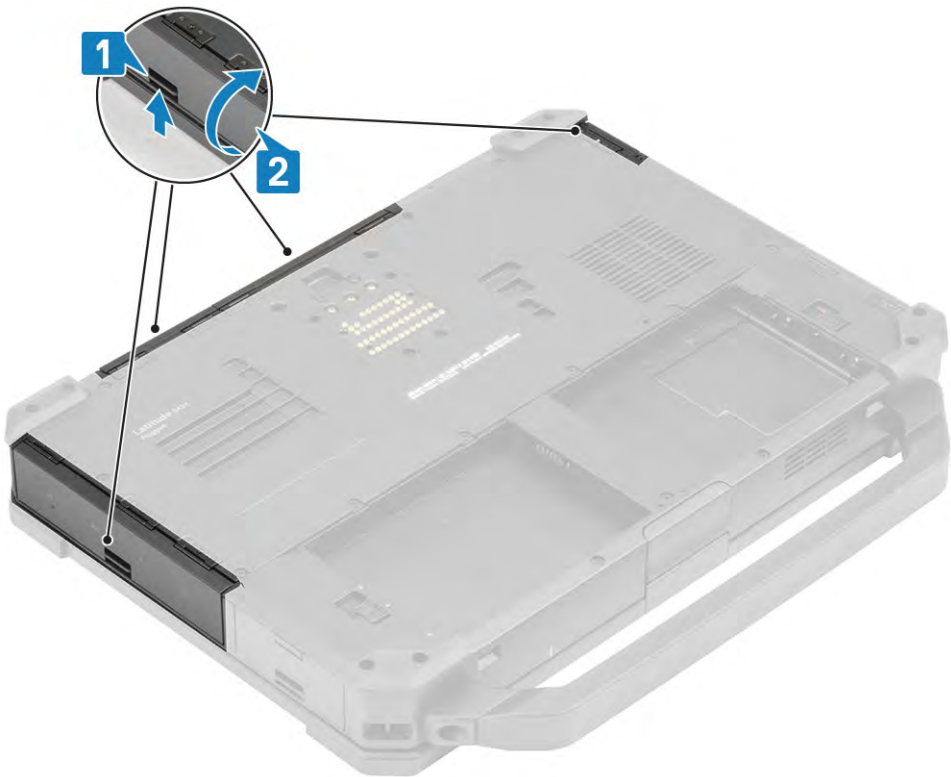
4 Follow the procedure in After working inside your computer.

Bottom Chassis Cover

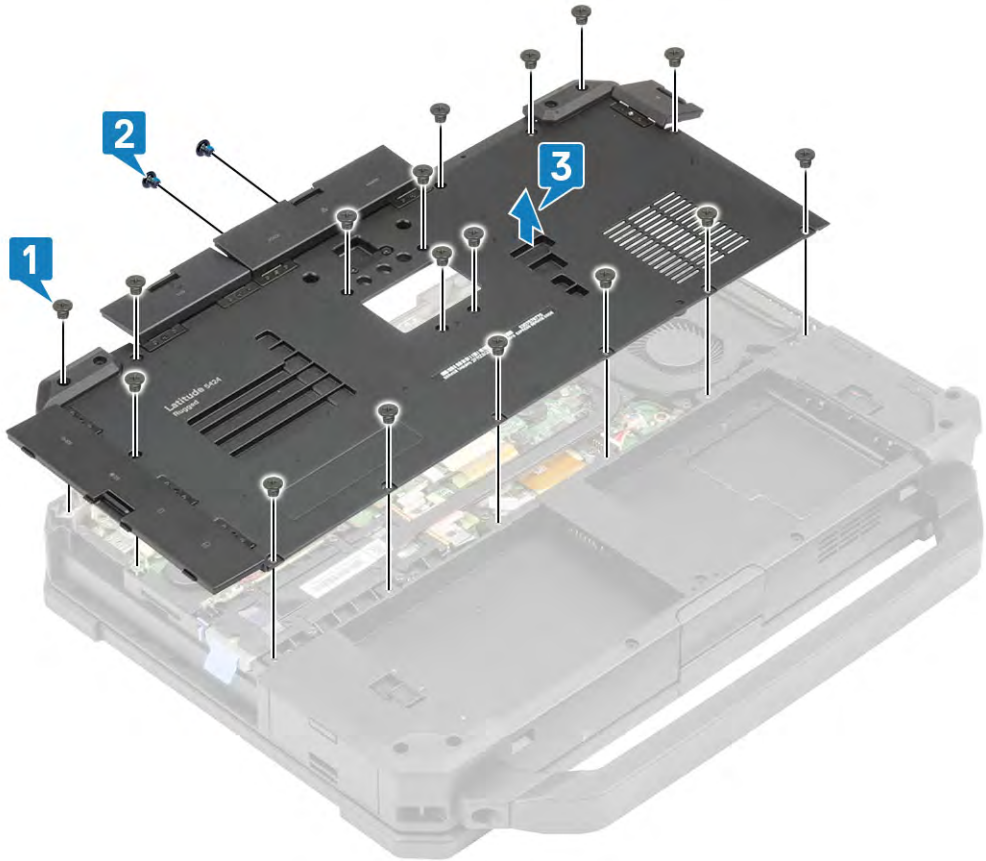
Removing the Bottom Chassis Cover

1 Follow the procedure in Before working inside your computer.

2 Unlock [1] and open the left, right and rear I/O doors. [2]



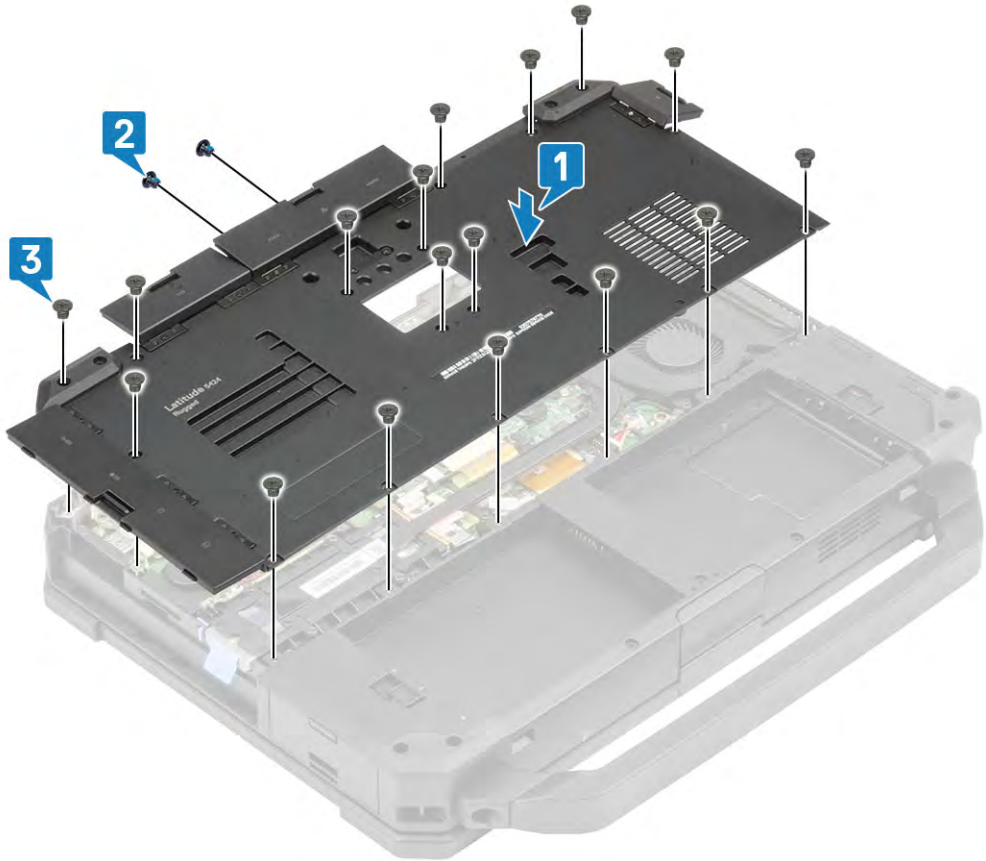
3 Loosen the 19 pieces of M2.5*5 screws from the bottom chassis cover. [1]



4 Loosen the two M2.5*6 screws inside the rear I/O[2] and lift the bottom chassis cover. [3]

Installing the Bottom Chassis Cover

1 Align and place the bottom chassis cover over the base [1]



2 Tighten the 19 pieces of M2.5*5 screws on the bottom chassis cover. [3]

3 Tighten the two M2.5*6 screws in the Rear I/O space and close the rear, right and left I/O doors. [2]

4 Follow the procedure in After working inside your computer.

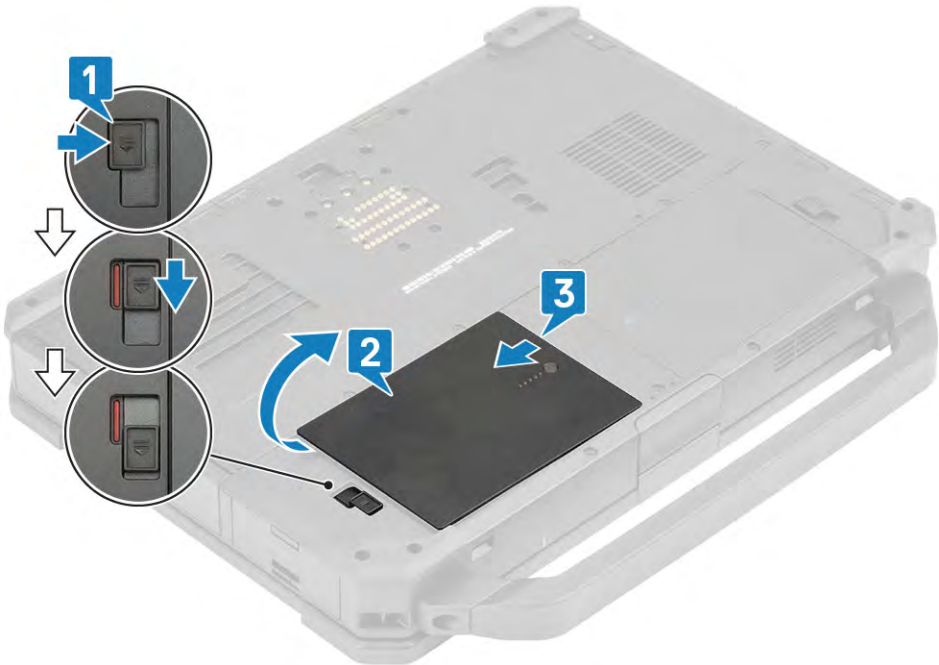
Battery

Removing the Batteries

There are two hot-swap capable batteries in the system.

1 Follow the procedure in Before working inside your computer.

2 Unlock the battery latch. [1]



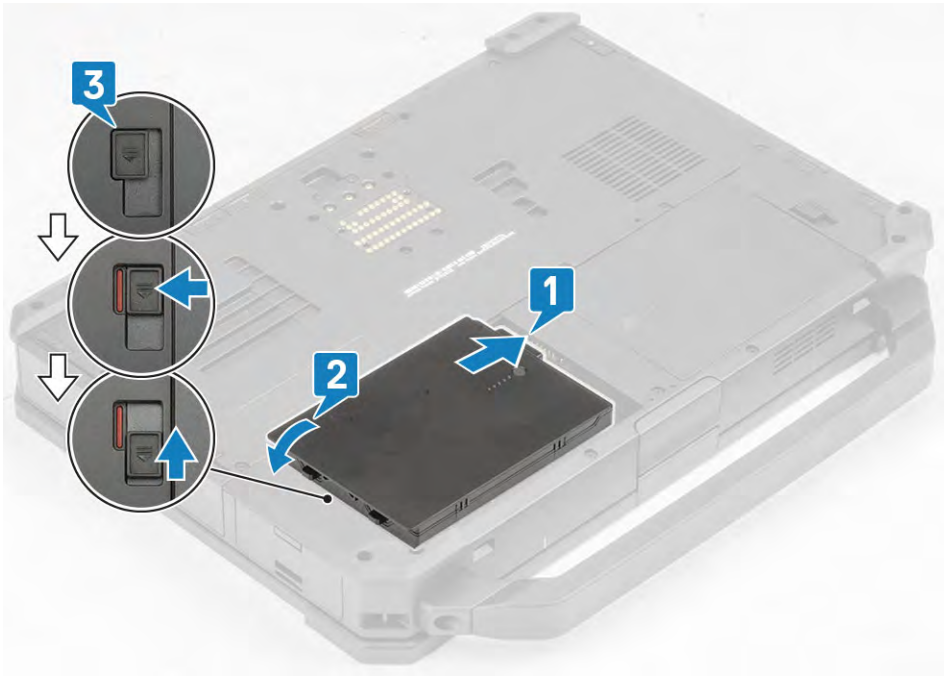
3 Lift the battery from the recess point at the edge of the battery. [2]

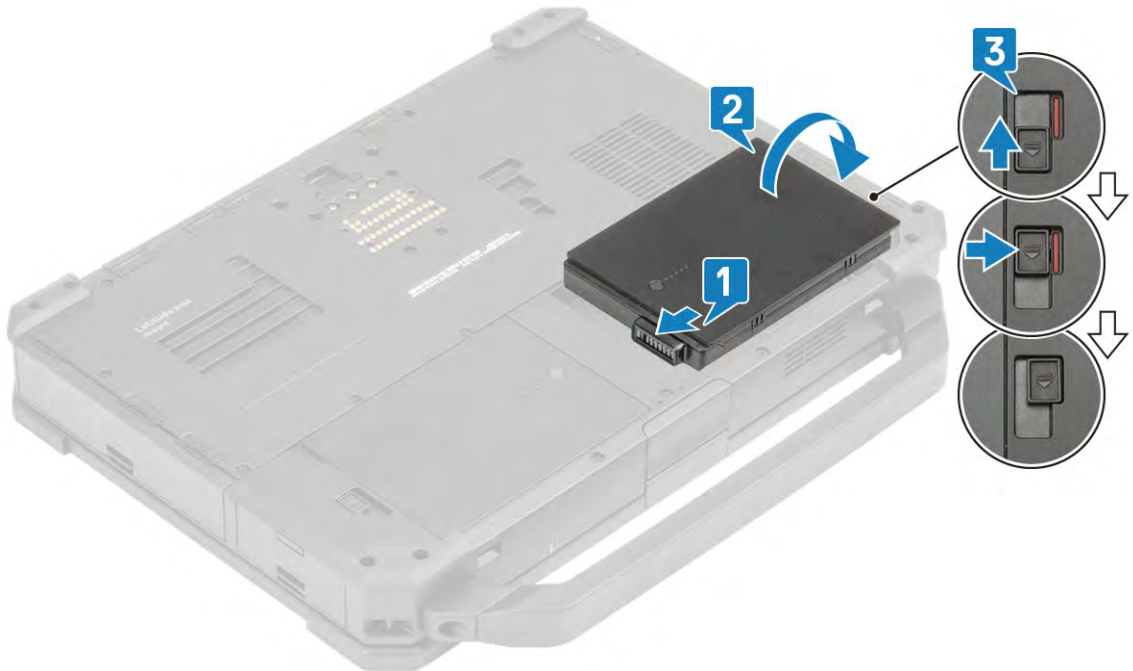
4 Slide the battery away from the system. [3]

Installing the Batteries

1 Place the battery aligning the contacts to that of the system. [1]

2 Press the battery locking it in it's position [2].





3 Lock the battery latch. [3]

4 Follow the procedure in After working inside your computer.

Keyboard

Removing the Keyboard

1 Follow the procedure in Before working inside your computer.

2 Remove the:

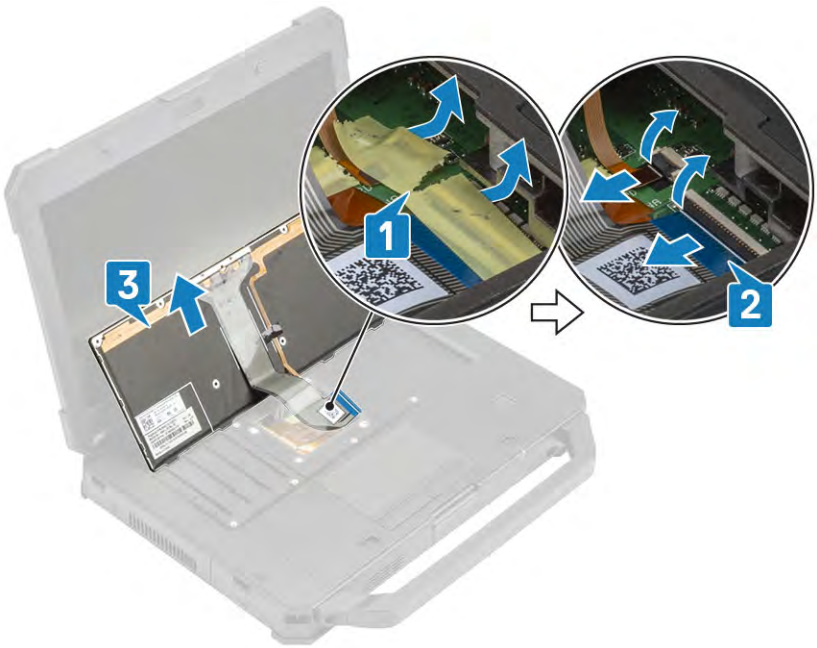
a Batteries

3 Loosen the six M2.5*5 screws from the keyboard [1] and pry at the bottom edge of the keyboard. [2].

4 Slide the keyboard [1] and flip over. [2]

5 Loosen the four M2*3 screws [1] and lift the keyboard cover from the system. [2]

6 Peel off the tape on the keyboard and back-light FPC [1] and disconnect from the motherboard. [2]



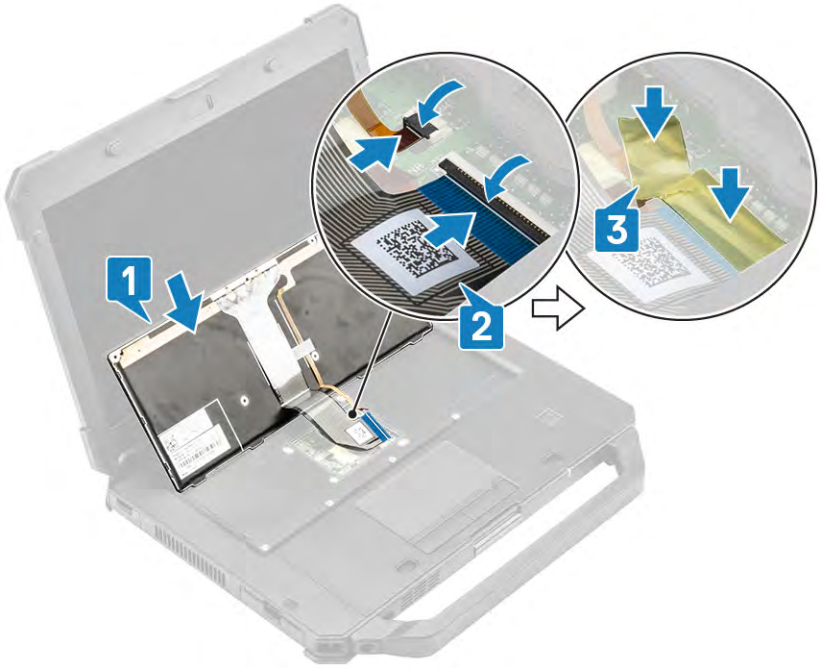
7 Remove the keyboard away from the system. [3]

NOTE: Tweezers might be required to access the keyboard FPC connectors.

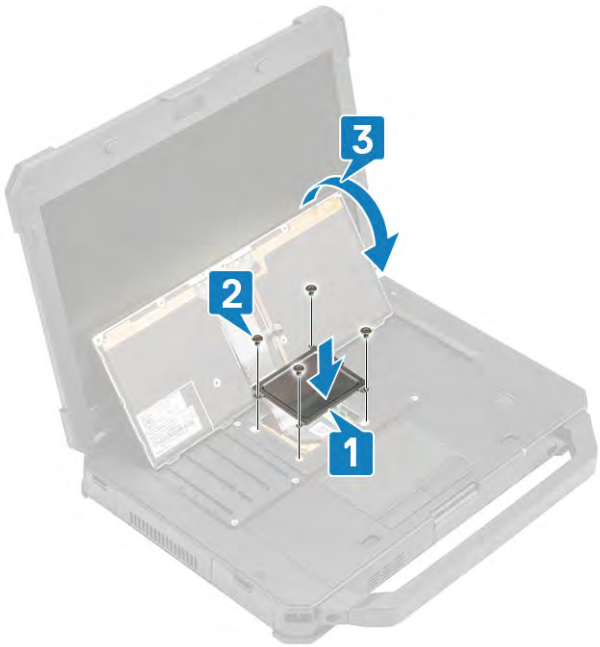
Installing the Keyboard

1 Align and place the keyboard [1] and connect the FPC to the motherboard [2], securing it with a tape. [3]

NOTE: Tweezers might be required to connect the keyboard FPC connectors.



2 Install the keyboard cover [1] and tighten the four M2*3 screws. [2]



3 Flip over the keyboard. [3]

4 Slide the keyboard [1] and align it to screw posts. [2]

5 Tighten the six M2.5*5 screws as shown below.

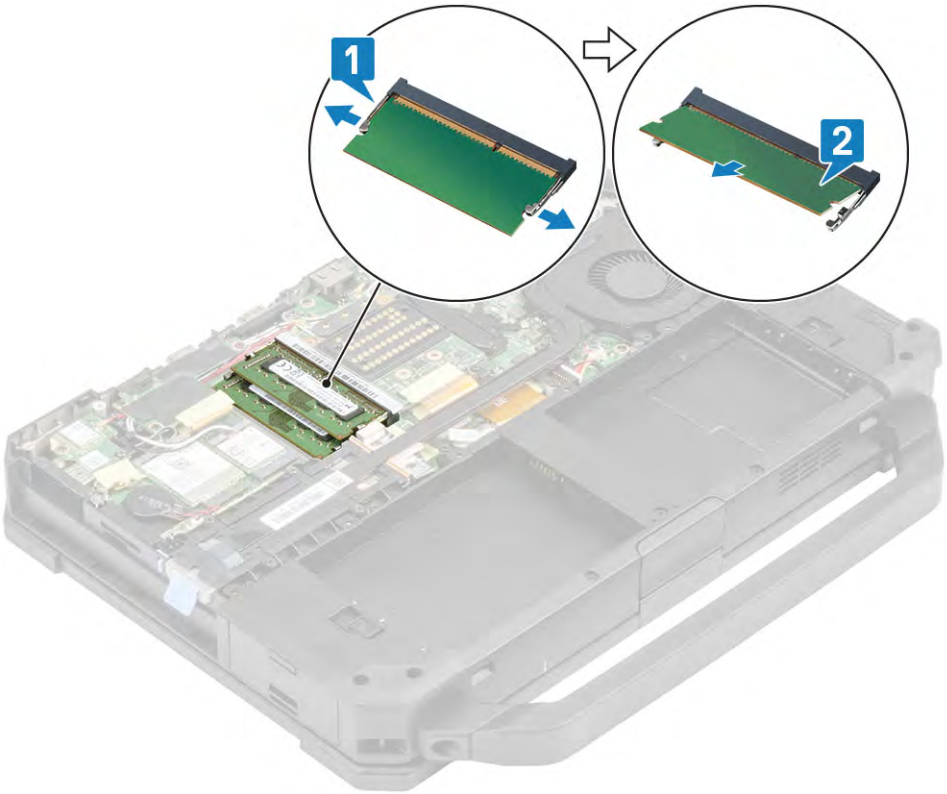
6 Follow the procedure in After working inside your computer.

Memory modules

Removing the Memory

1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Battery
   b Bottom Chassis Cover

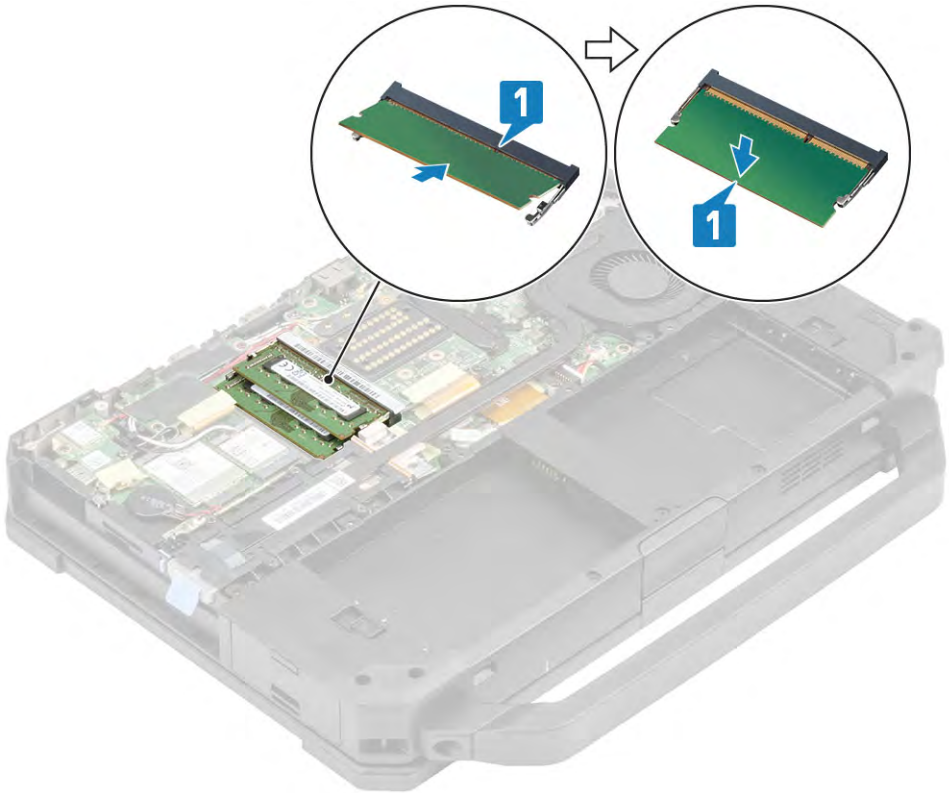
3 Pull the clips securing the memory module until the memory module pops up. [1]



4 Remove the memory module from the memory module socket. [2]

Installing the Memory

1 Align the keyed notch on the memory module at with the memory module socket at an acute angle.
2 Insert the memory module into the memory module socket. [1]

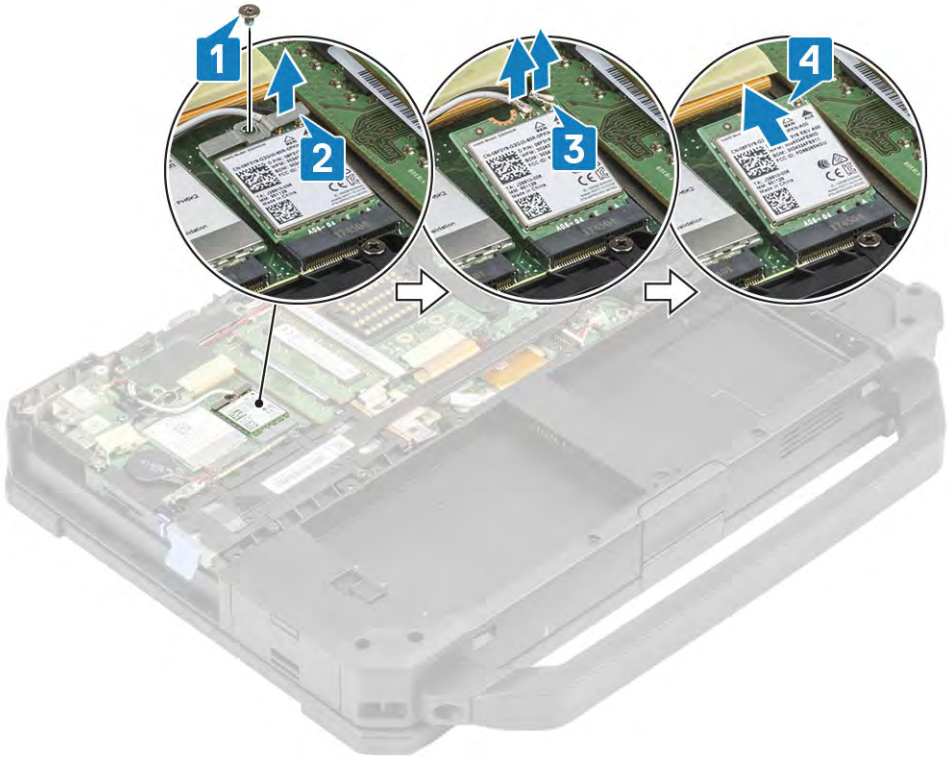


3 Press the memory module until it clicks into place. [2]
4 Install the:
   a Battery
   b Bottom Chassis Cover
5 Follow the procedure in After working inside your computer.

WLAN card

Removing the WLAN Card

1 Remove the :
   a Battery
   b Bottom Chassis Cover
2 Loosen the single M2*3 screw securing the WLAN card to metallic bracket [1] and lift the metallic bracket. [2]
3 Disconnect the auxiliary and main antennae cables. [3]



4 Slide the WLAN card out of the slot. [4]

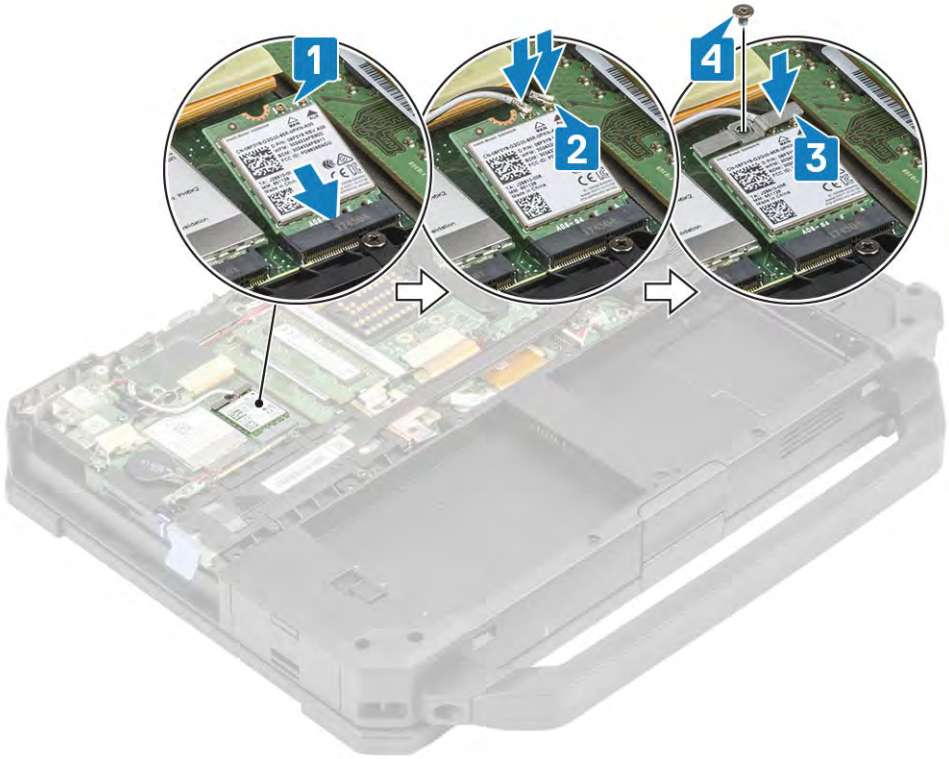
5 Follow the procedure in After working inside your computer.

Installing the WLAN card

1 Align the WLAN card to the M.2 Slot. [1]

2 Reconnect the antennae cables. [2]

3 Place the metallic bracket on the WLAN card. [3]



4 Secure the card using the M2*3 screw. [4]

5 Follow the procedure in After working inside your computer.

WWAN card

Removing the WWAN Card

1 Follow the procedure in Before working inside your computer.

2 Remove the:

   a Battery

   b Bottom Chassis Cover

3 Loosen the single M2*3 screw.

4 Remove the metallic bracket. [2]

5 Disconnect the antennae cables. [3]

6 Slide the WWAN card out. [4]

Installing the WWAN Card

1 Align and slide the WWAN card in the M.2 slot. [1]

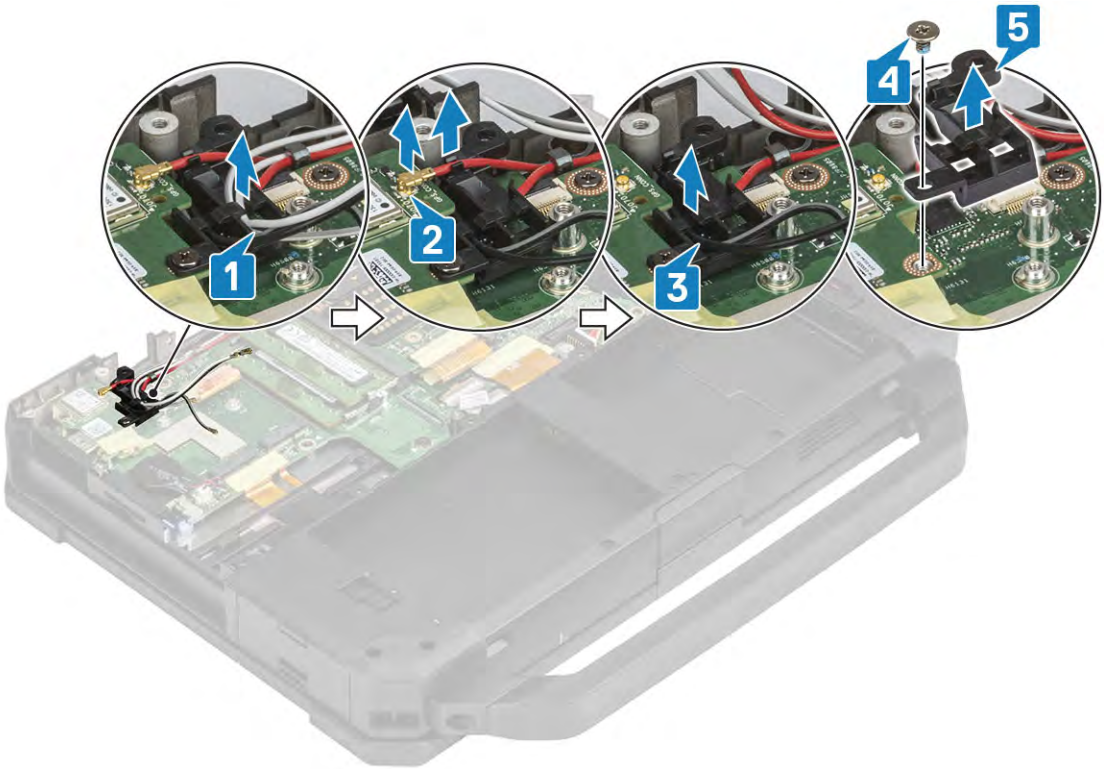
2 Connect the antennae cables. [2]

3 Secure the WWAN card using the metallic bracket. [3]
4 Tighten the M2.3 screw. [4]
5 Install the:
   a Bottom Chassis Cover
   b Battery
6 Follow the procedure in After working inside your computer.

Global Positioning System (GPS)

Removing the GPS module

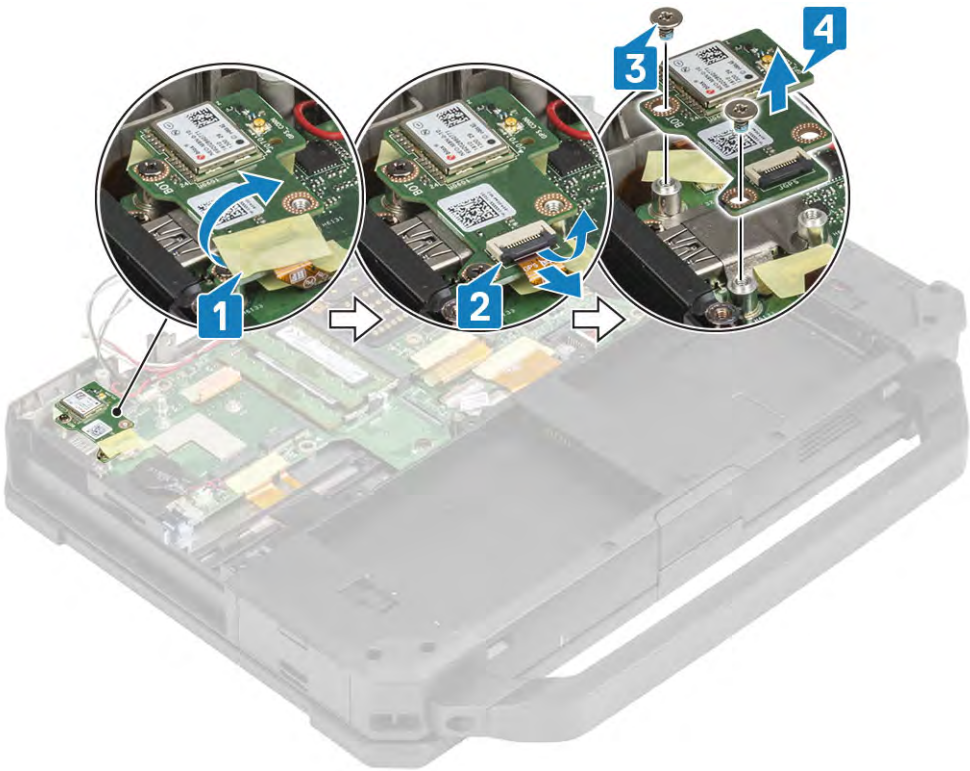
1 Follow the procedure in Before working inside your computer.
2 Remove the
   a Battery
   b Bottom Chassis Cover
3 Un-route [1] and disconnect the antennae cable[2], to access and un-route the antennae cables[3]



4 Loosen the two M2.5*5 screw[4] on the RF holder and remove it. [5]

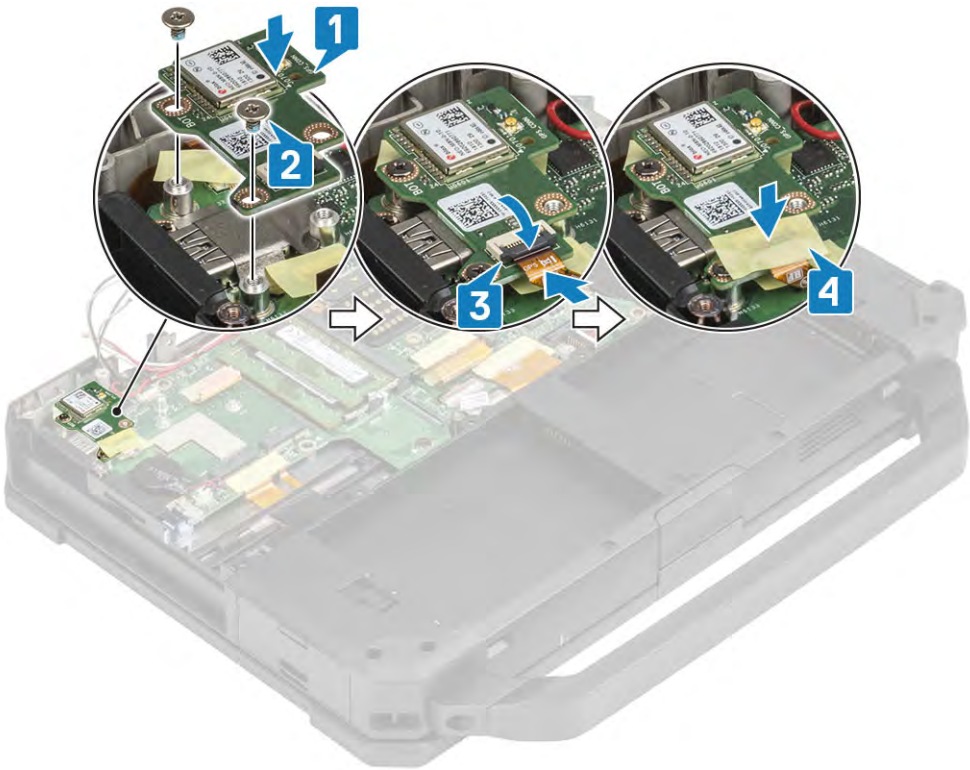
5 Peel off the inductive tape on the GPS board connector [1] and disconnect it. [2]

6 Loosen the three M2.5*5 screw [3] and lift the GPS daughterboard away from the system. [4]



Installing the GPS module

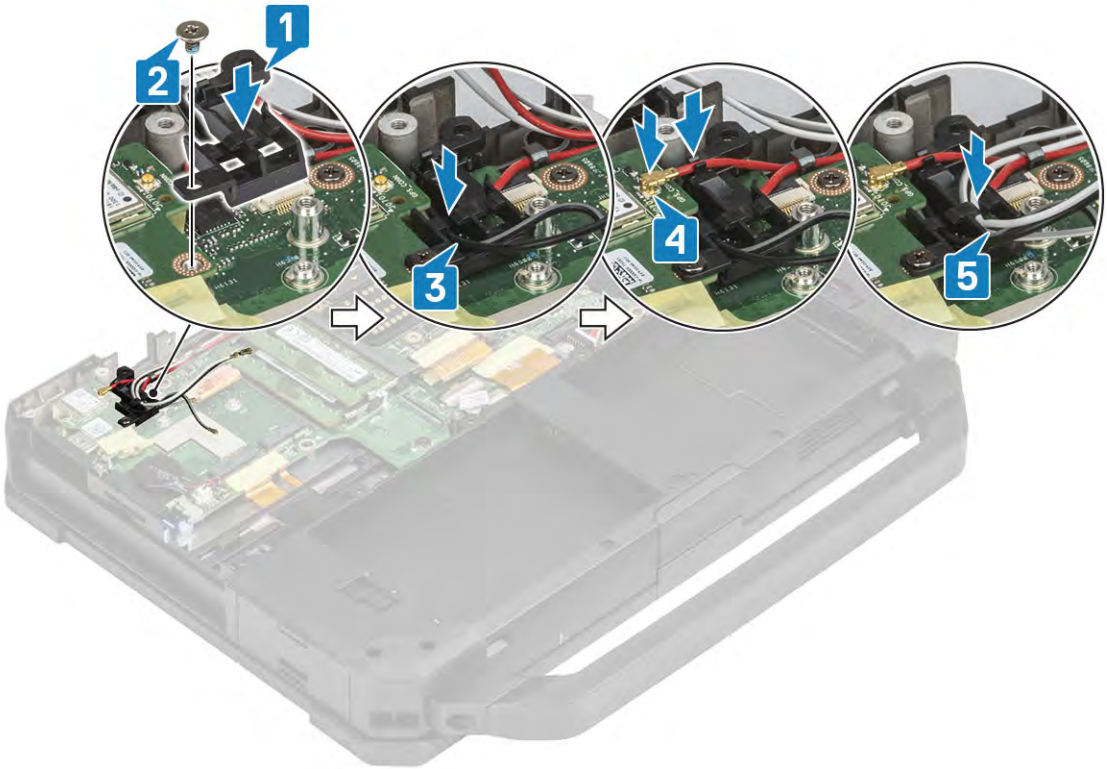
1 Align and place the GPS daughterboard on the screw posts [1] and tighten the two M2.5*5 screws on GPS board. [2]



2 Connect the GPS daughterboard FPC(Motherboard side first) [3] and secure the connection using an insulation tape. [4]

3 Install the RF bracket [1] and secure it using a M2.5*5 screw. [2]

4 Re-route the antennae cables [3,5] and connect the antennae cable on the GPS daughterboard. [4]

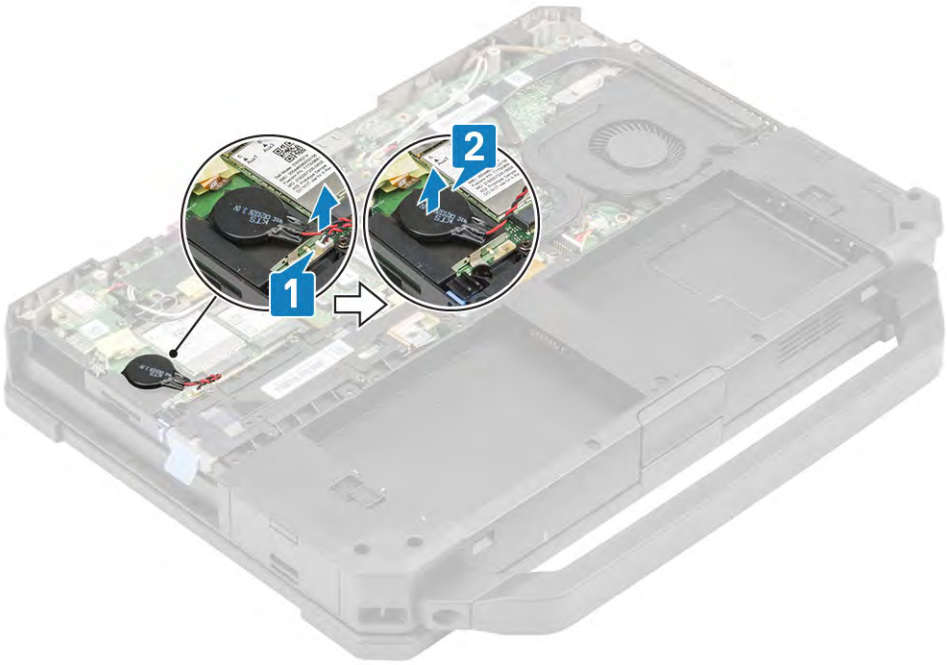


5 Follow the procedure in After working inside your computer.

Coin-cell battery

Removing the Coin Cell

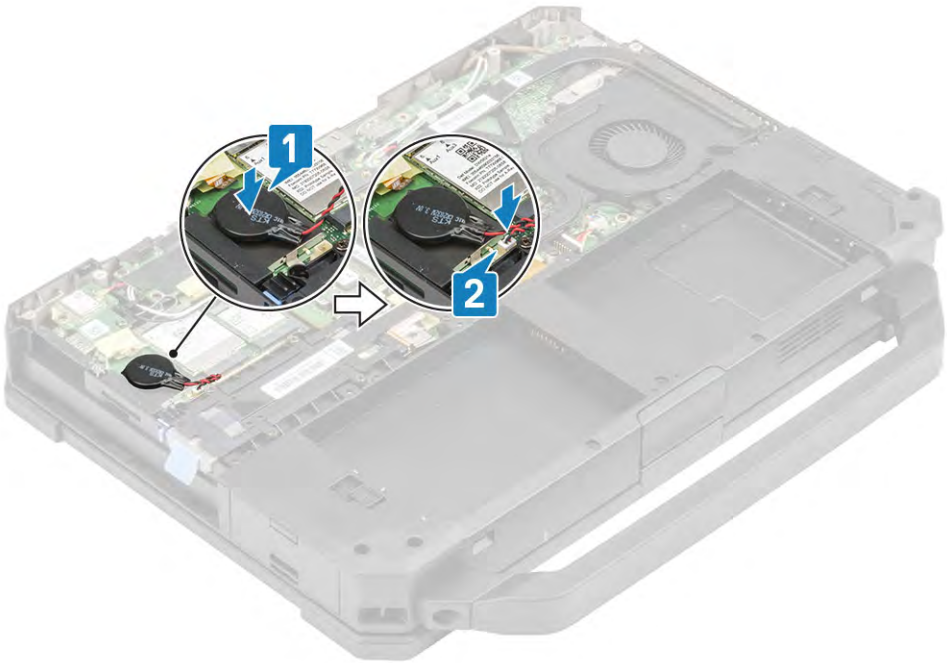
1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Bottom Chassis
   b Battery
3 Disconnect the coin cell connector from the motherboard. [1]



4 Lift the cell to separate it from the machine. [2]

Installing the Coin Cell

1 To install the coin cell, place and secure the coin cell. [1]



2 Connect the coin cell battery connector on the motherboard. [2]

3 Install the:

a Bottom Chassis Cover

4 Follow the procedure in After working inside your computer.

PCIe Heatsink Fan Assembly

Removing the PCIe Heatsink Fan Assembly

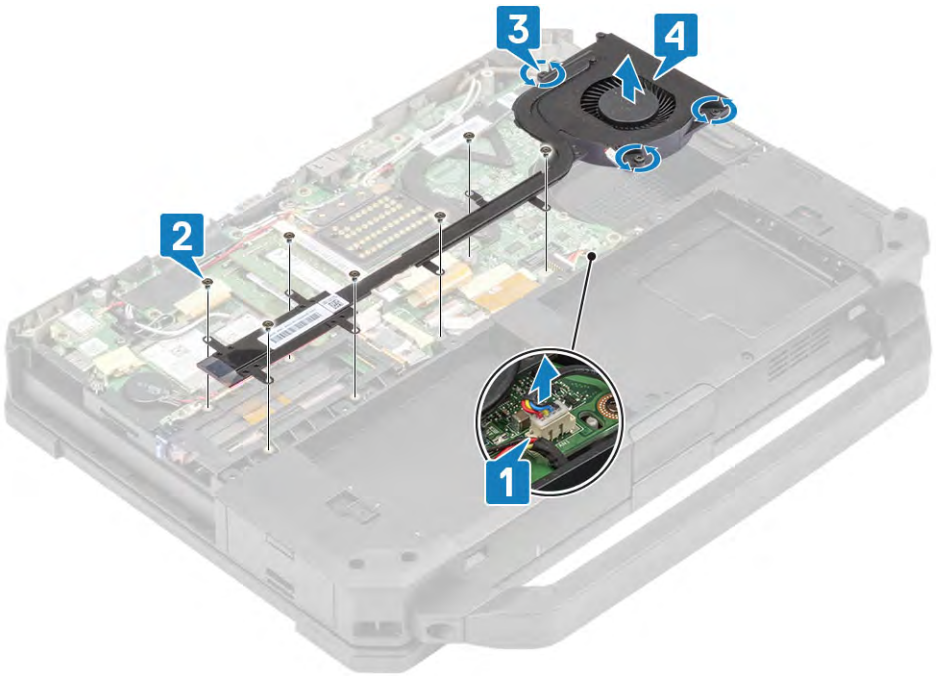
1 Follow the procedure in Before working inside your computer.

2 Remove the:

a Battery

b Bottom Chasis Cover

3 Disconnect the fan cable from the motherboard. [1]

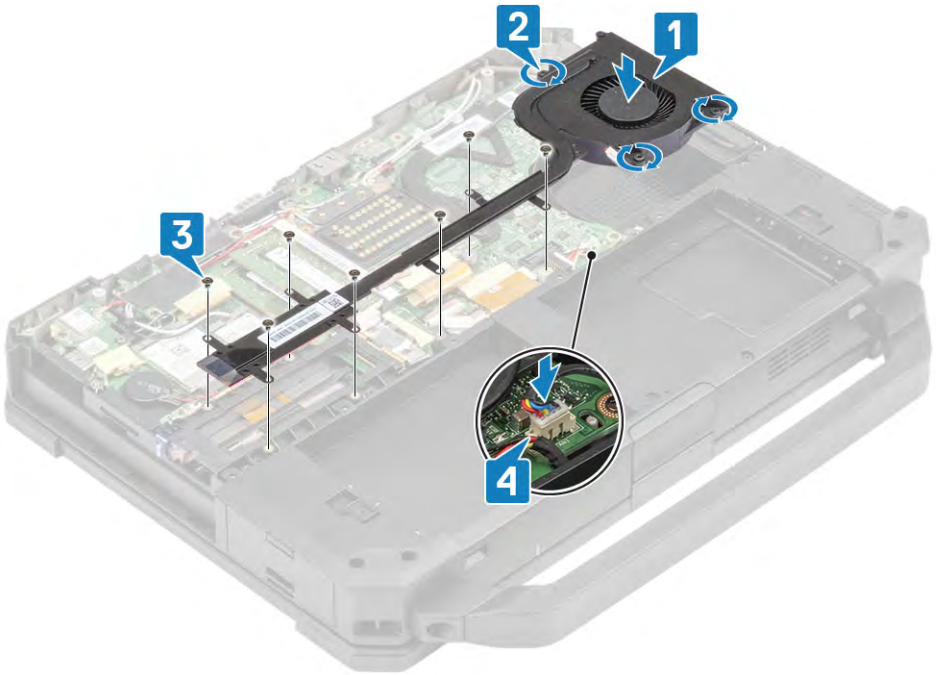


4 Loosen the seven pieces of M2.5. [2]

5 Loosen the four M1.6 captive screws securing the PCIe heatsink to the system[3] and lift the PCIe heatsink assembly to seperate it from the machine. [4]

Installing the PCIe Heatsink Fan Assembly

1 Align and place the PCIe heatsink assembly along the screw posts. [2]



2 Tighten the seven pieces of M2.5 and four M1.6 screws securing the PCIe heatsink bracket to the system [3] and connect the fan cable. [4]

3 Install the:
   a Bottom Chassis Cover
   b Battery

4 Follow the procedure in After working inside your computer.

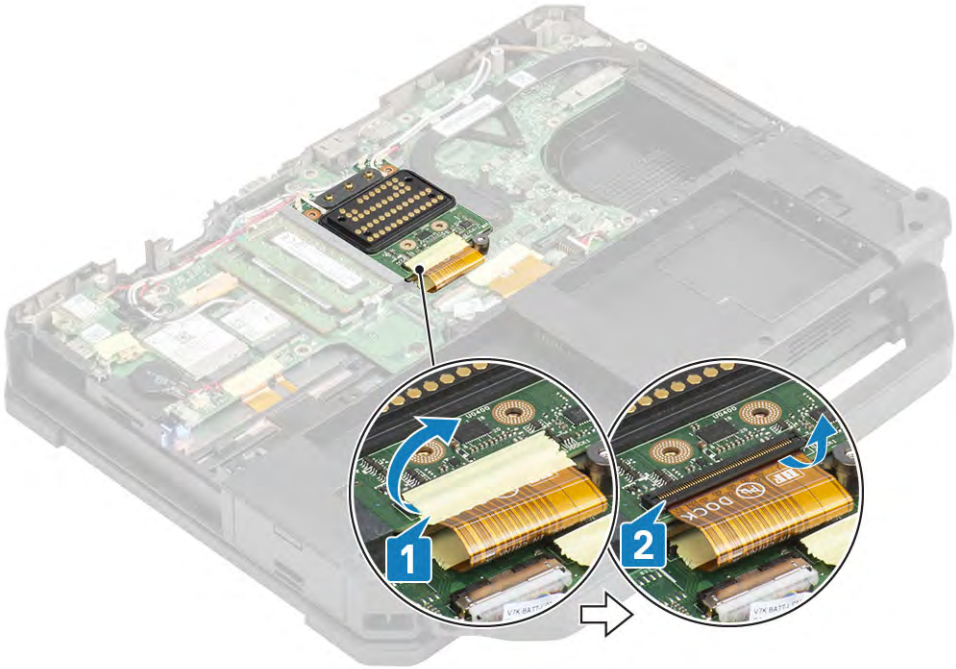
Docking Port Assembly

Removing the Docking Port Assembly

1 Follow the procedure in Before working inside your computer.

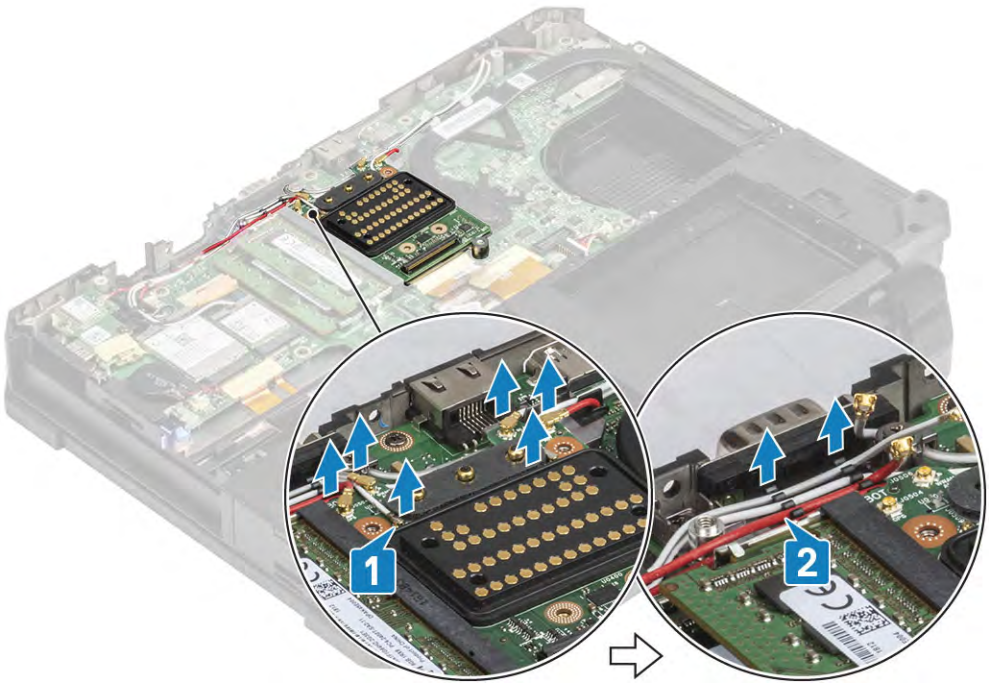
2 Remove the:
   a Battery
   b Bottom Chassis Cover
   c PCIe Heatsink assembly

3 Peel off the tape securing the Dock FPC to the motherboard. [1]

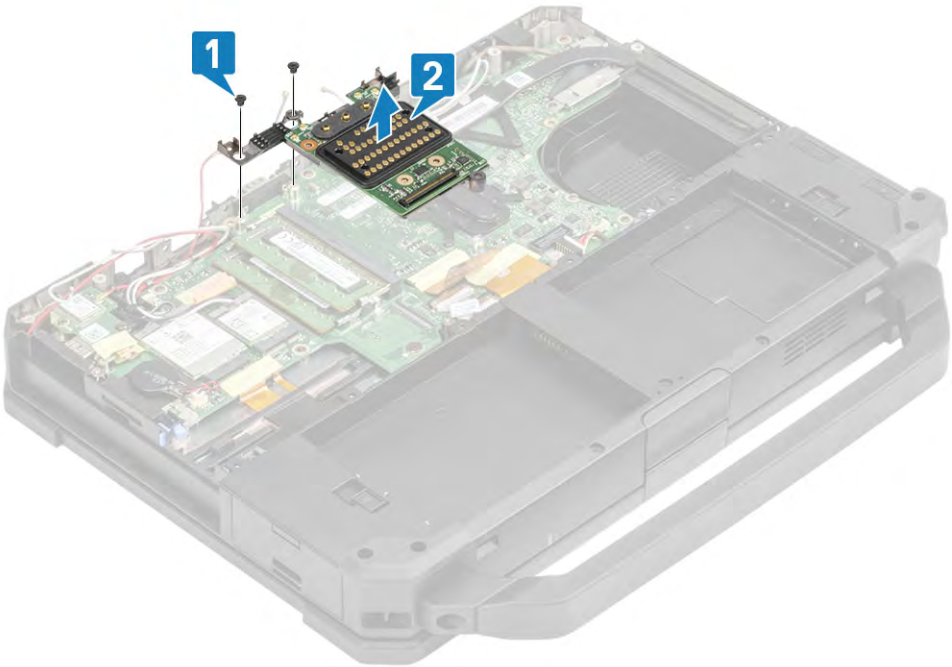


4 Disconnect the Dock FPC. [2]

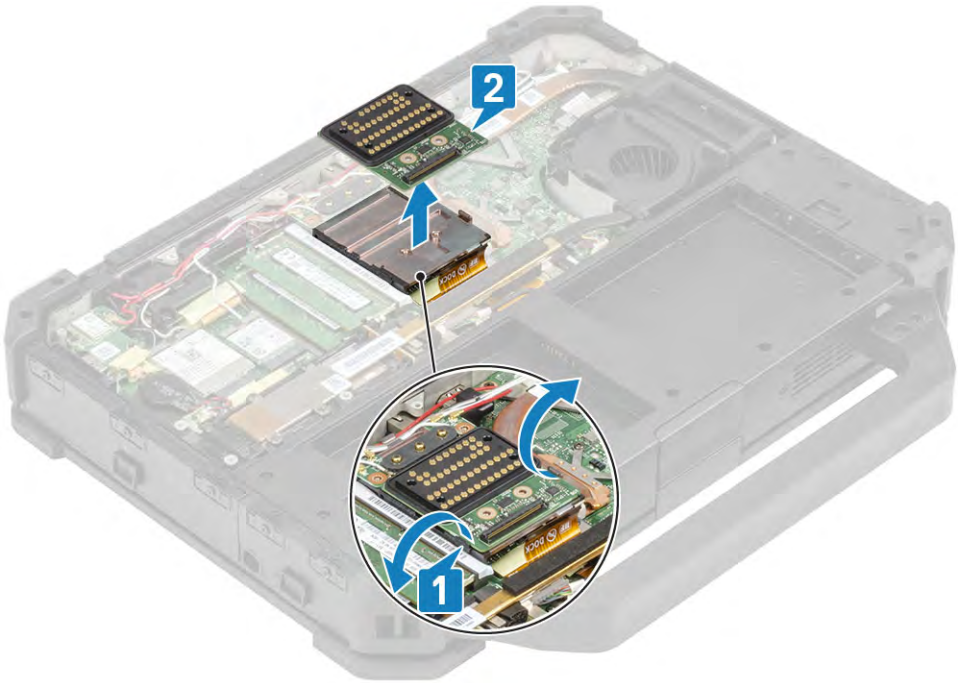
5 Disconnect [1] and un-route [2] the antennae cables.



6 Loosen the two M2.5*5 screws [1] and lift the docking board assembly to complete disassembly. [2]

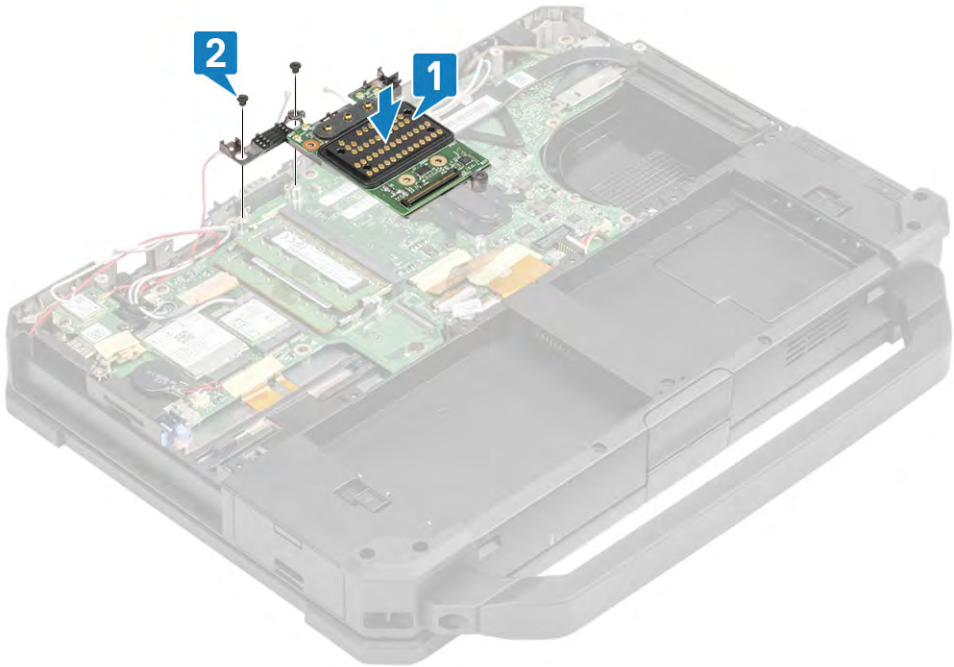


NOTE: The dock PCB can be separated from rest of the assembly, by prying the securing tabs[1] and sliding the dock PCB out. [2]



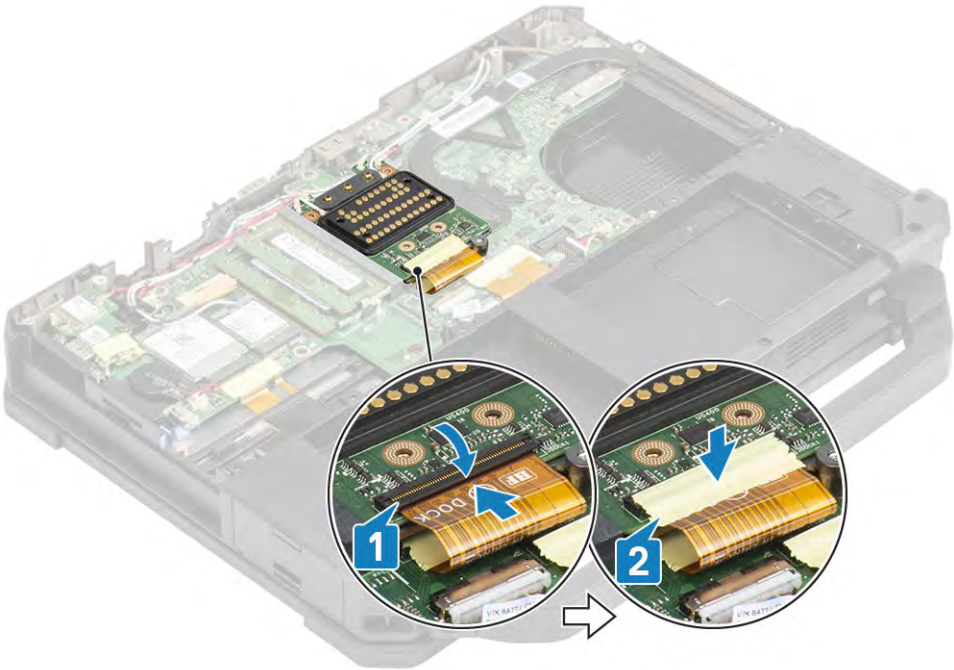
Installing the Docking Port Assembly

1 Align and place the docking port assembly.[1]



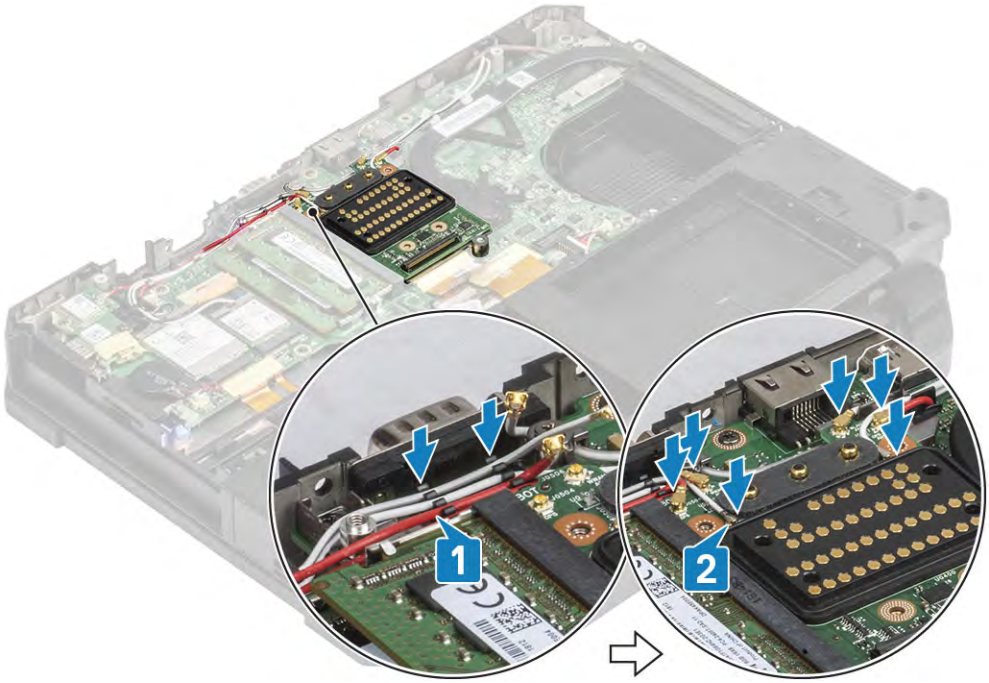
2 Tighten the two M2.5*5 screws. [2]

3 Connect the Dock FPC to the motherboard (underneath the Dock PCB) and then on the Dock PCB. [1]



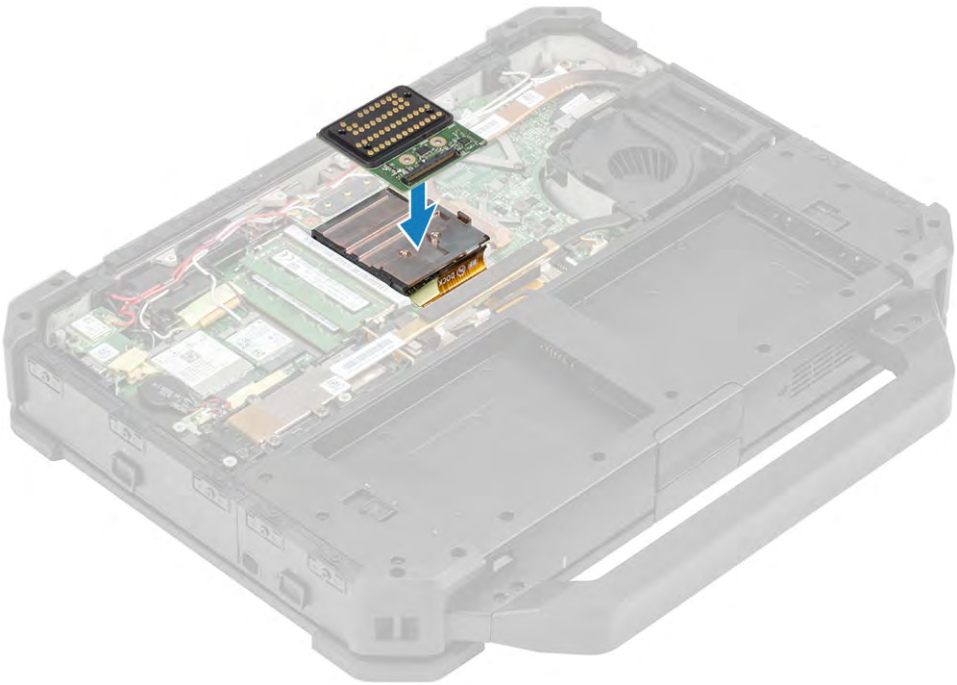
4 Secure the Docking board FPC connection using a piece of insulation tape. [2]

5 Secure the antennae cables along the routing channel. [1]



6 Connect the antennae cables on the RF pass through connectors. [2]

NOTE: Dock PCB can be separately installed after installing the docking assembly to avoid any damage to dock PCB.



7 Install the:
   a PCIe Heatsink assembly
   b Battery
   c Bottom Chassis Cover
8 Follow the procedure in After working inside your computer.

Heatsink Assembly

Removing the Heatsink Assembly

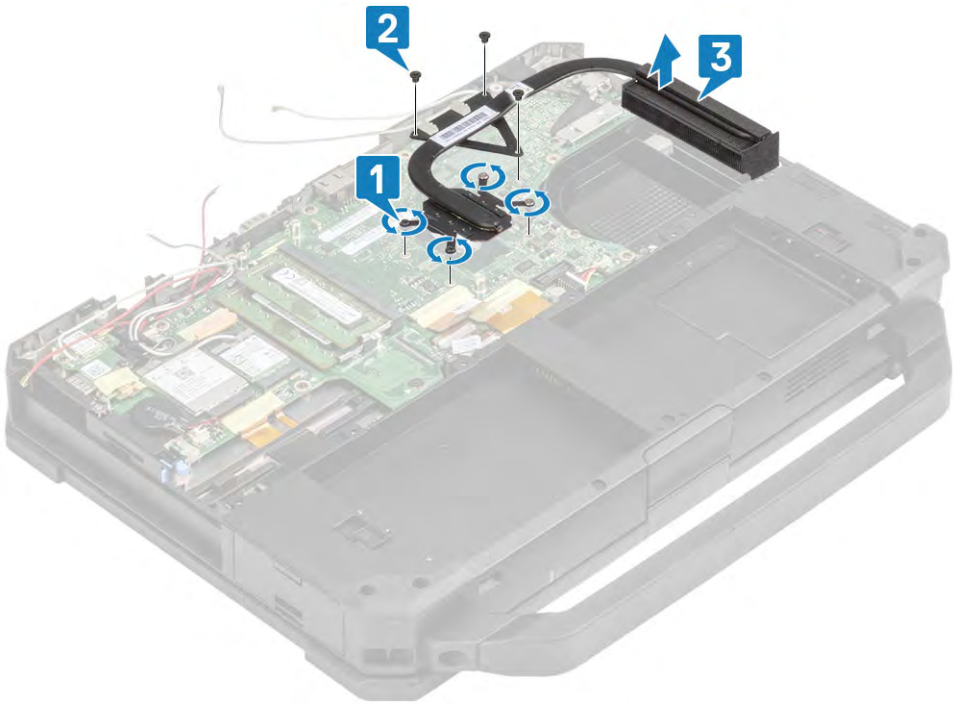
1 Follow the procedure in Before working inside your computer.

2 Remove the:

- a Battery
- b Bottom Chassis Cover
- c WLAN Card
- d WWAN Card
- e PCIe Heatsink assembly
- f Docking port assembly

3 Undo the antennae cable from the tabs located on the heatsink pipe as shown below.

4 Loosen the three M2.5*5 screws and one M1.6*5 screw on the thermal module. [1]

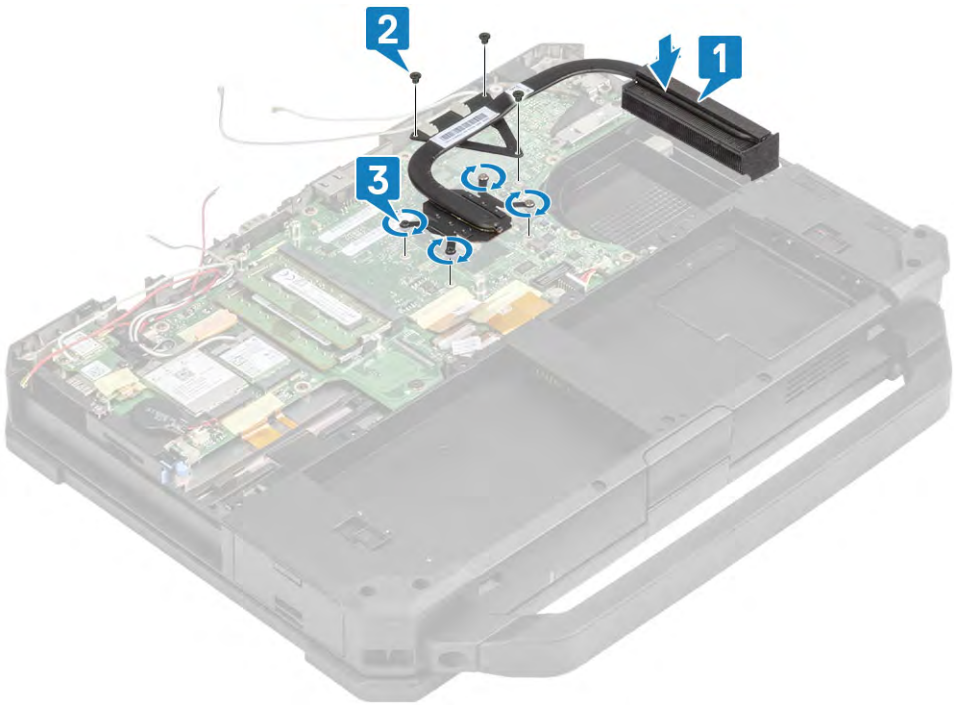


5 Loosen three M2*5 screws securing the thermal module near GPU. [2]

6 Lift the heat sink assembly away from the system to complete removal. [3]

Installing the Heatsink Assembly

1 Align and place the heatsink assembly on the assigned screw posts. [1]



2 Tighten the three M2.5*5 screws and one M1.6*5 screw on the thermal module and three M2*5 screws securing the thermal module near GPU [2 ,3] .

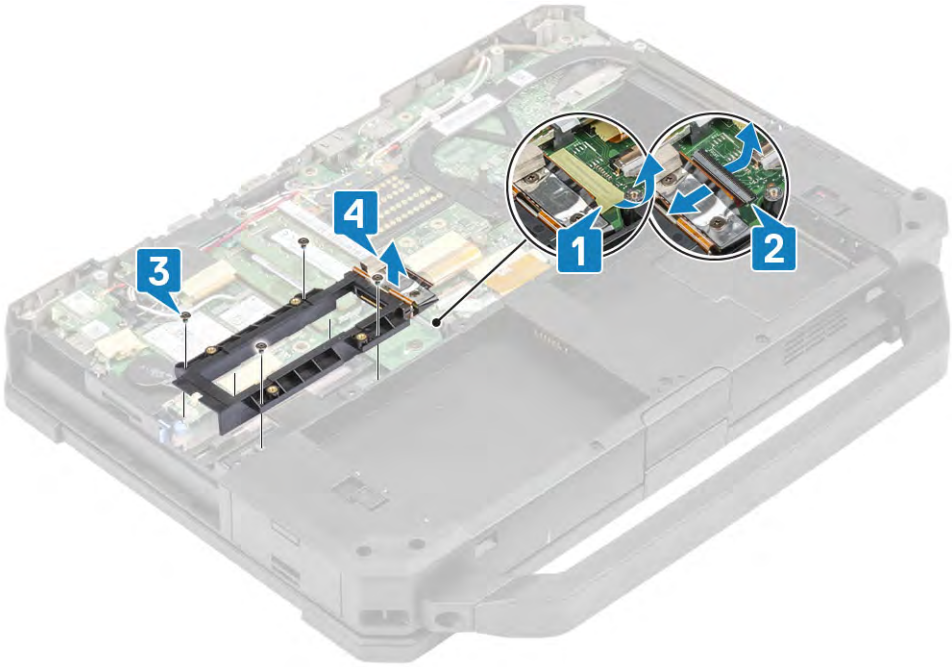
3 Re-route the antennae cables along the routing channel on the heatsink pipe.

4 Install the:
   a Docking Port assembly
   b PCIe Heatsink assembly
   c WWAN Card
   d WLAN Card
   e Bottom Chassis Cover
   f Battery
5 Follow the procedure in After working inside your computer.

Primary SSD Rail

Removing the Primary SSD Rail

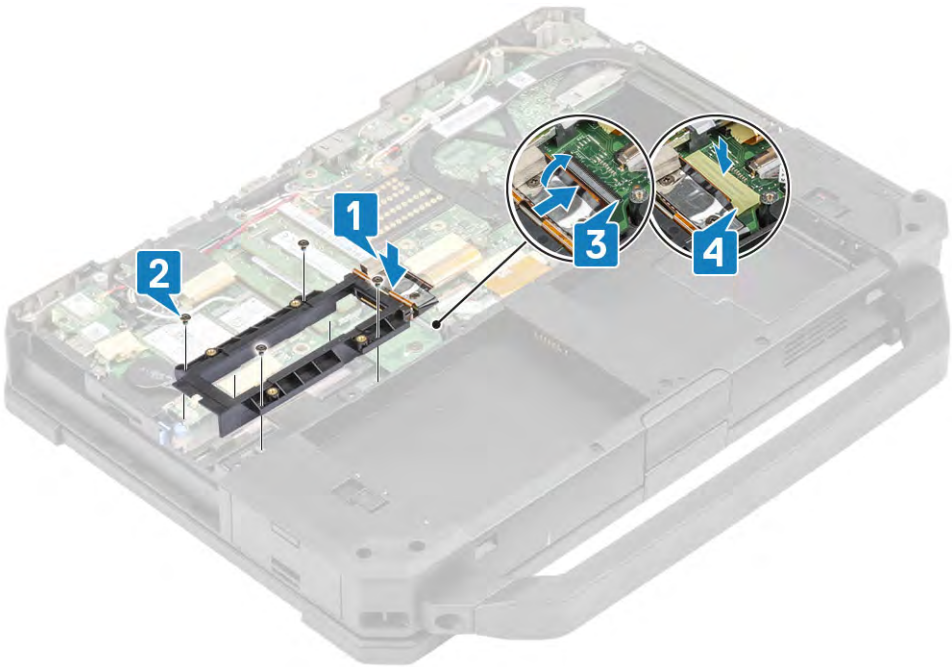
1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Battery
   b Bottom Chassis Cover
   c PCIe Heatsink Assembly
3 Peel off the inductive tape on the Primary SSD connector. [1]



4 Disconnect the FPC connector on the motherboard end. [2]
5 Loosen the six M2*3 screws. [3]
6 Lift the bracket along with cable to complete the removal. [4]

Installing the Primary SSD Rail

1 Connect the Primary SSD cable to the motherboard. [1]



2 Replace a piece of inductive tape on the FPC connector. [2]
3 Align and place the Primary SSD rail on the screw posts. [3]
4 Tighten the six M2*3 screws.
5 Install the :

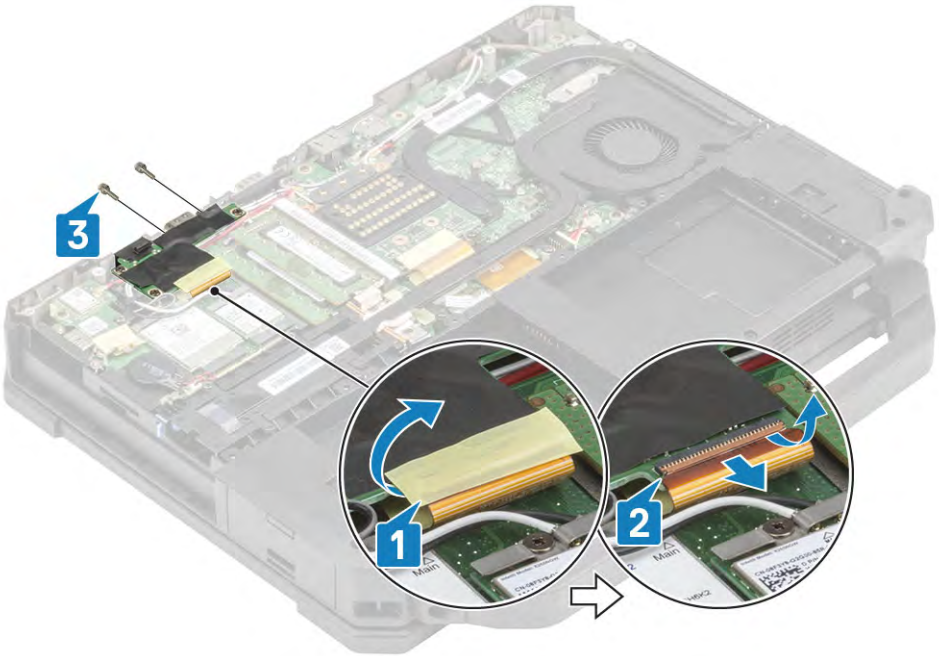
a PCIe Heatsink Assembly
b Bottom Chassis Cover
c Battery

6 Follow the procedure in After working inside your computer.

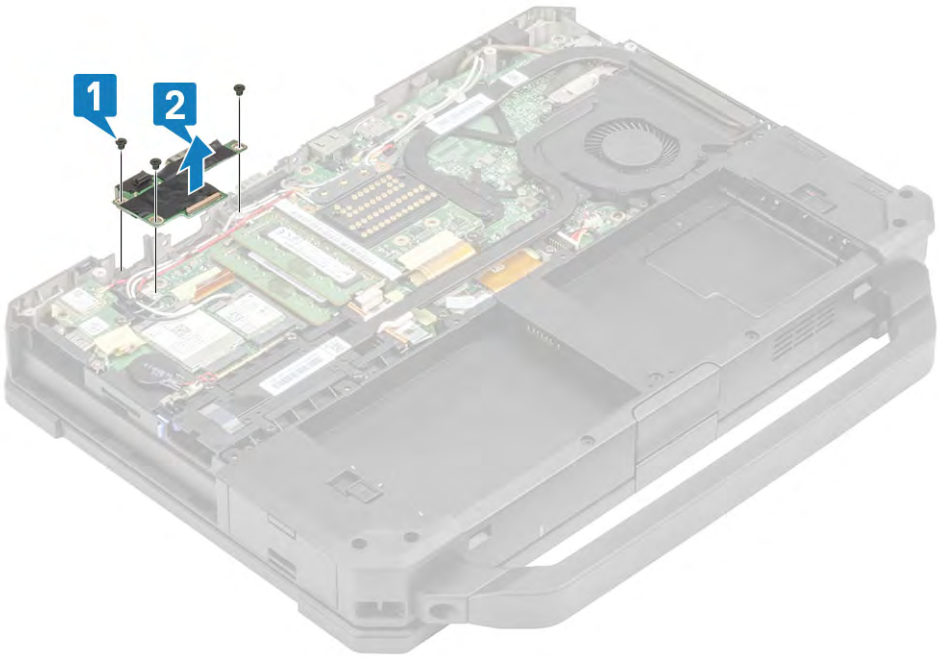
Rear Input-Output Board

Removing the Rear I-O Board

1 Follow the procedure in Before working inside your computer.
2 Remove the:
a Batteries
b Bottom Chassis Cover
c PCIe Heatsink assembly
d Docking port assembly
e WLAN Card
f WWAN Card
3 Peel off the inductive tape on the I/O board FPC connector [1] to disconnect it [2] and loosen the two cap screws on the serial port. [3]



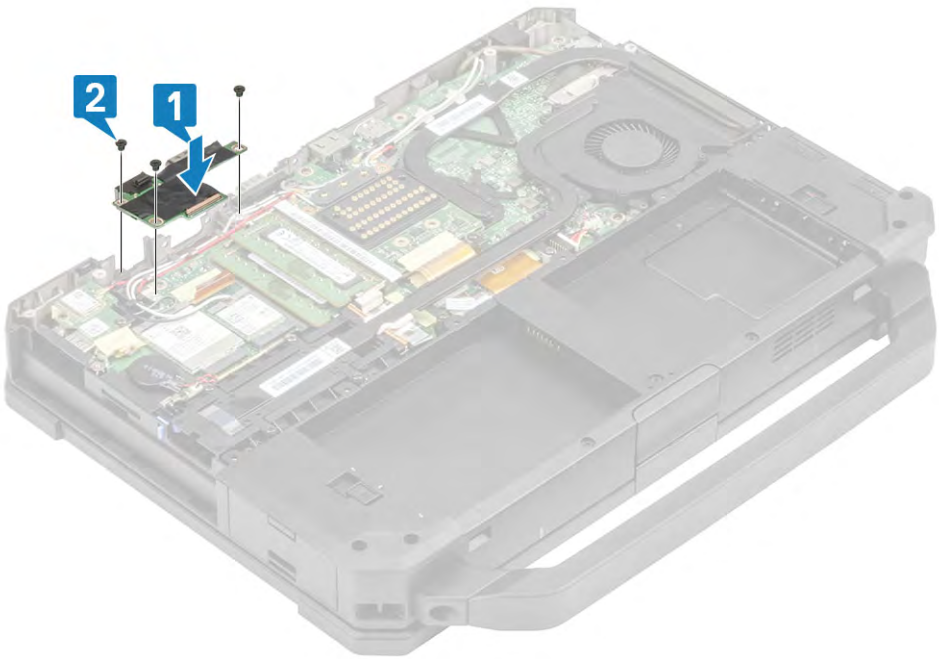
4 Loosen the three M2.5*5 screws [1] and lift the I/O board away from the system to complete disassembly. [2]



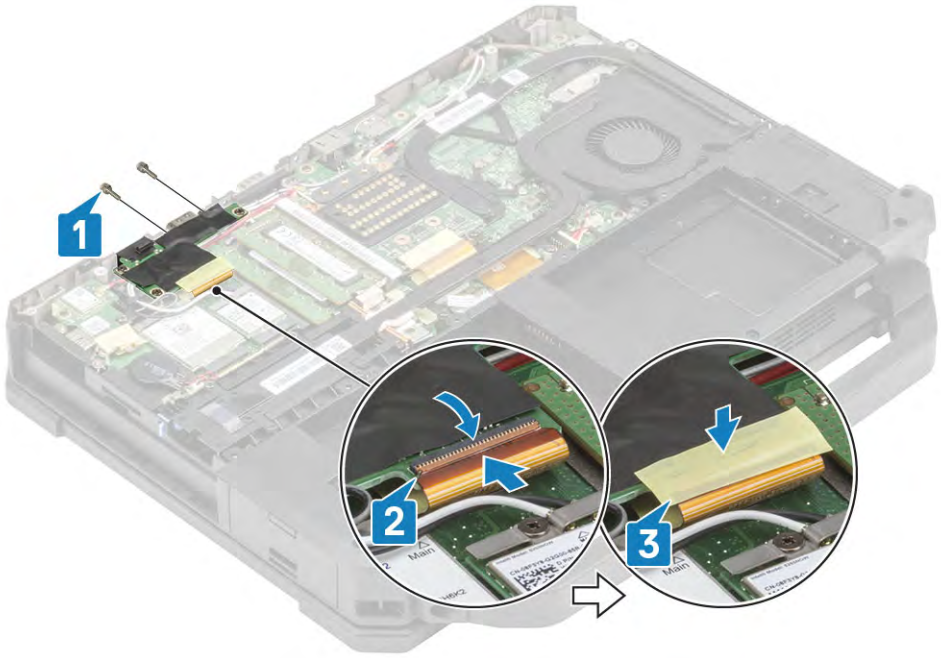
NOTE: A 5mm socket wrench should be used to remove/install the caps screws.

Installing the Rear I-O Board

1 Align and place the I/O board on the screw mounts and slide the ports through the face plate [1] and secure it using three M2.5*5 screws.[2]



2 Tighten the two cap screws along the Serial port [1] and connect the I/O board FPC[2] to the motherboard and then to I/O board itself. [3]

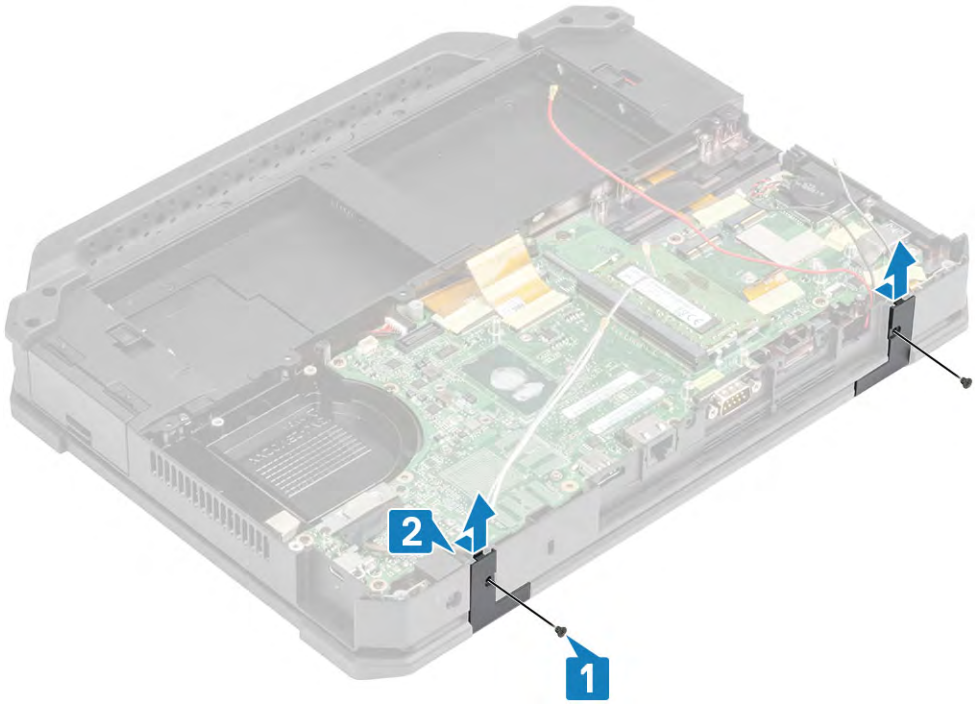


3 Install the:
   a WWAN Card
   b WLAN Card
   c PCIe Heatsink assembly
   d Batteries
   e Bottom Chassis Cover
4 Follow the procedure in After working inside your computer.

Hinge Covers

Removing the Hinge Covers

1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Batteries
   b Bottom Chassis Cover
   c WLAN Card
   d WWAN Card
   e Docking Port assembly
   f PCIe Heatsink Fan Assembly
   g Heatsink
3 Loosen the two M2.5*5 on either sides [1] and lift the bracket. [2]

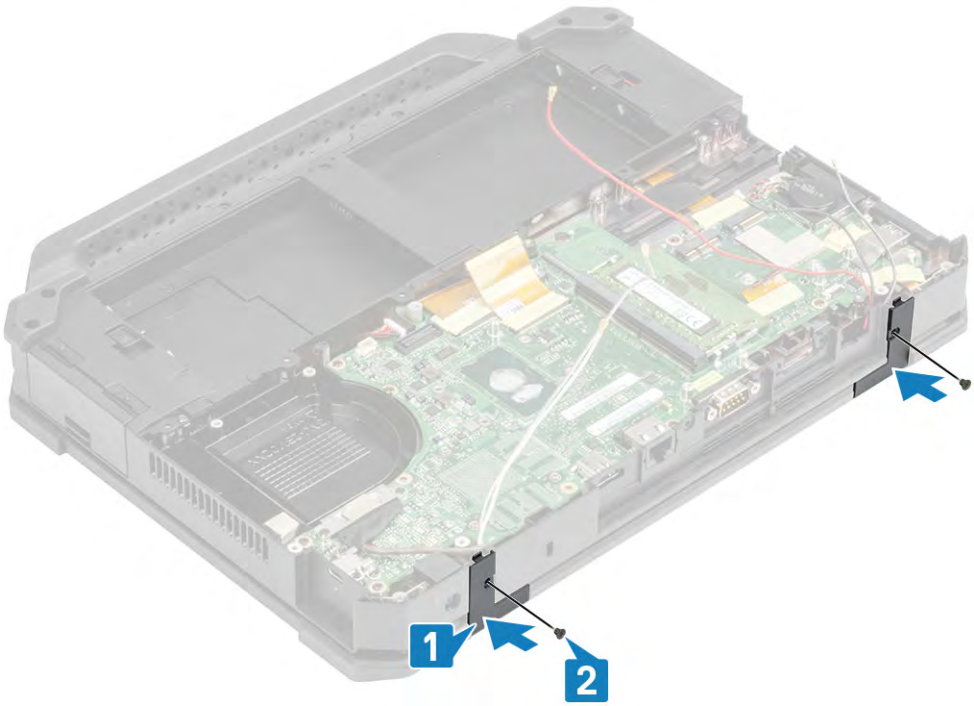


4 Open the lcd lid at an obtuse angle [1] and push the hinge covers from the rear end to pop it out from front. [2]

Installing the Hinge Covers

1 Open the LCD lid in an obtuse angle [1] and pop in the hinge covers until it clicks in place. [2]

2 Place the brackets[1] and secure it using two M2.5*5 on either sides[2].



3 Install the:

a Heatsink
b PCIe Heatsink assembly
c Docking Port Assembly
d WWAN Card
e WLAN Card
f Bottom Chassis Cover
g Batteries

4 Follow the procedure in After working inside your computer.

Display assembly

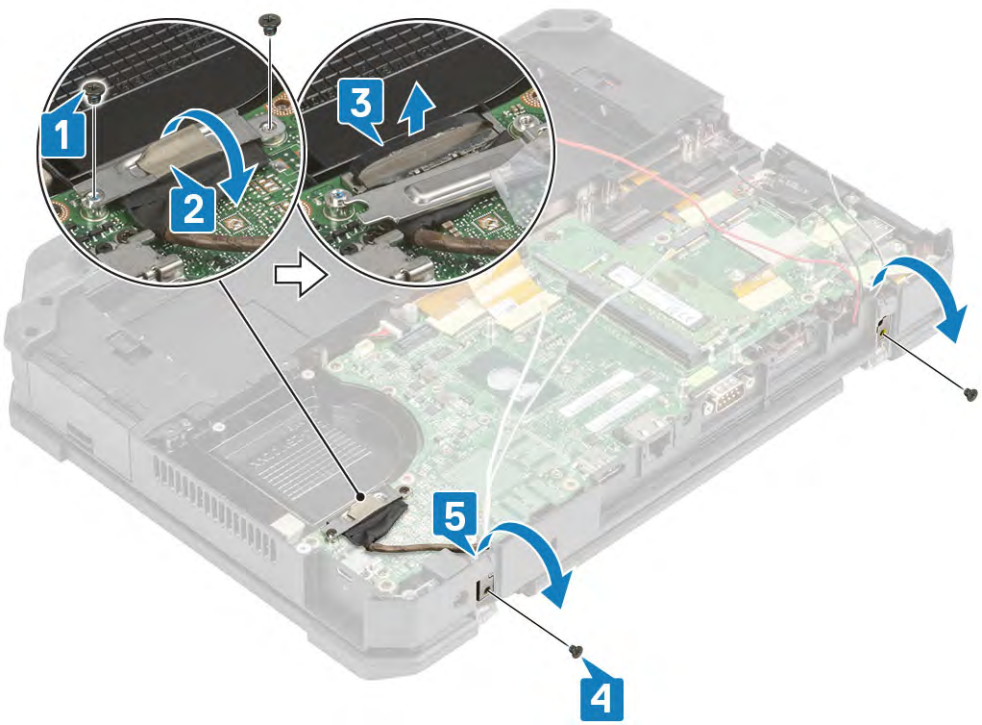
Removing the Display Assembly

1 Follow the procedure in Before working inside your computer.

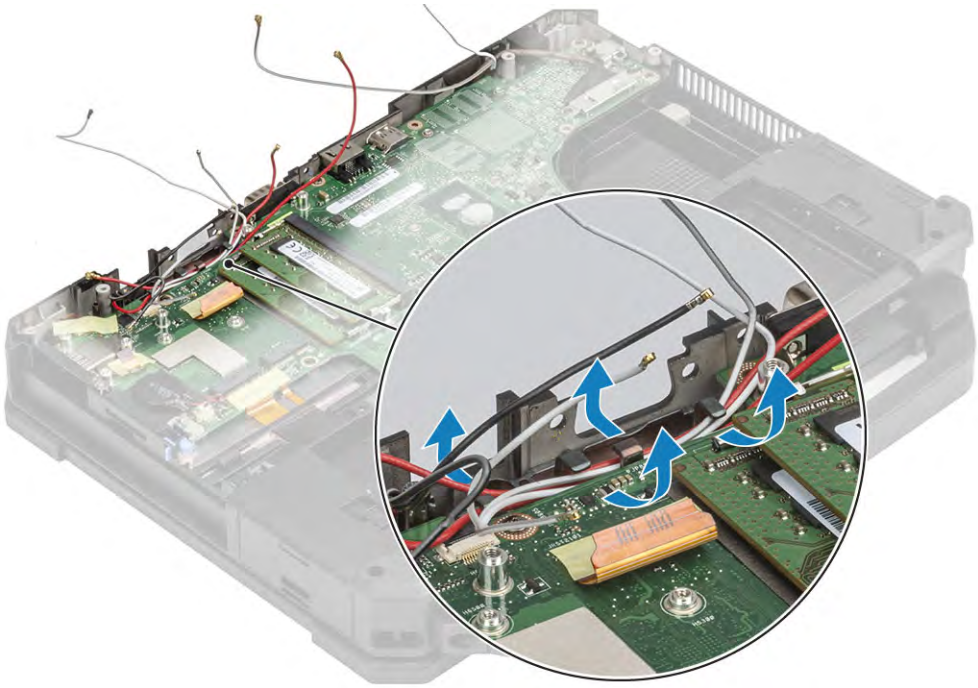
2 Remove the:

a Batteries
b Bottom Chassis Cover
c PCIe Heatsink assembly
d Docking port assembly
e WLAN Card
f WWAN Card
g GPS Board
h Heatsink
i Hinge Covers

3 Loosen the two M2*3 screws [1] , and flip the bracket over [2] to pull and disconnect the EDP cable from the motherboard. [3]



4 Un-thread the antennae cables [4] and loosen the two M2*3 securing the hinges to base assembly [5] .



5 Flip the system over and open the LCD lid.

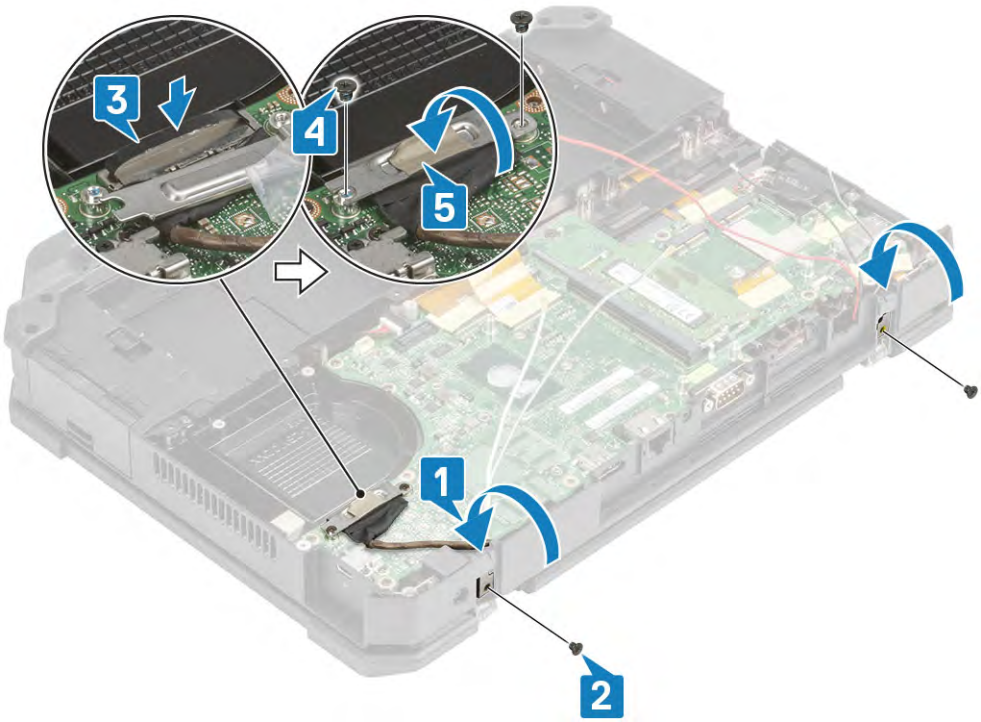
6 Loosen the four screws on either sides[1] to separate the LCD assembly from the rest of the chassis. [2]

Installing the Display Assembly

1 Tighten the two screws on either sides [1,2].

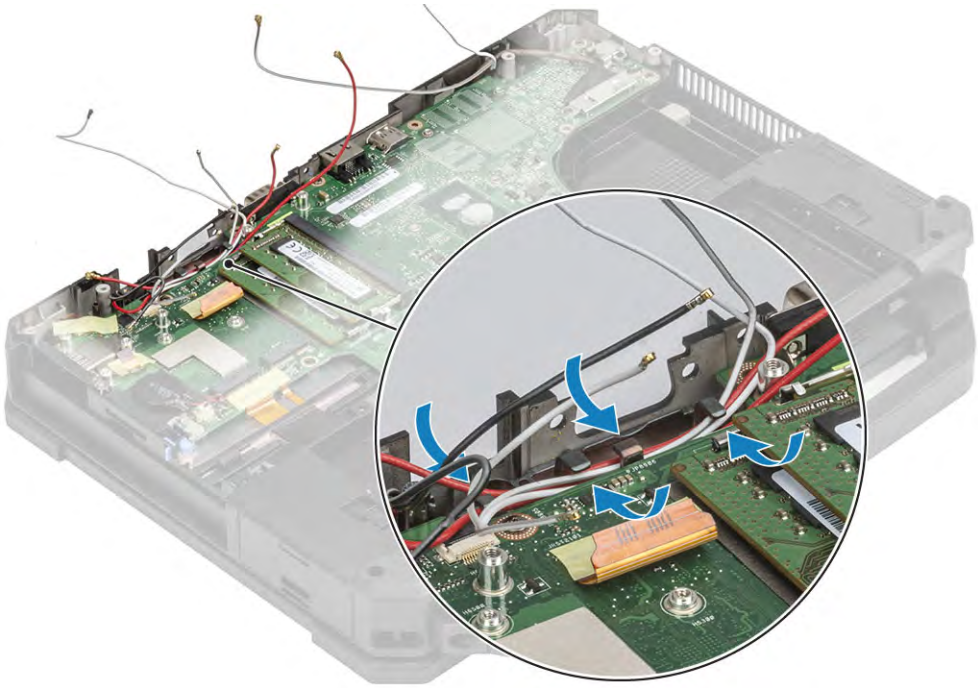
2 Close the lid [3] and flip over the system.

3 Tighten the two M2*3 securing the hinges to base assembly [2] and route the antennae cables. [1]



4 Connect the EDP cable [3] and place the EDP bracket over the cable [4] and secure it using two M2*3 screws. [5]

NOTE: Please refer to Antennae cable routing diagram in Critical Callout section and tuck the cables along the guiding tabs shown below.



5 Install the:
   a Hinge Covers
   b Heatsink
   c GPS Card
   d WLAN Card
   e WWAN Card
   f PCIe Heatsink assembly
   g Docking port assembly
   h Bottom Chassis Cover
   i Batteries
6 Follow the procedure in After working inside your computer.

LCD Bezel and Back Cover Assembly

Removing the LCD with Bezel and the Display Backcover Assembly

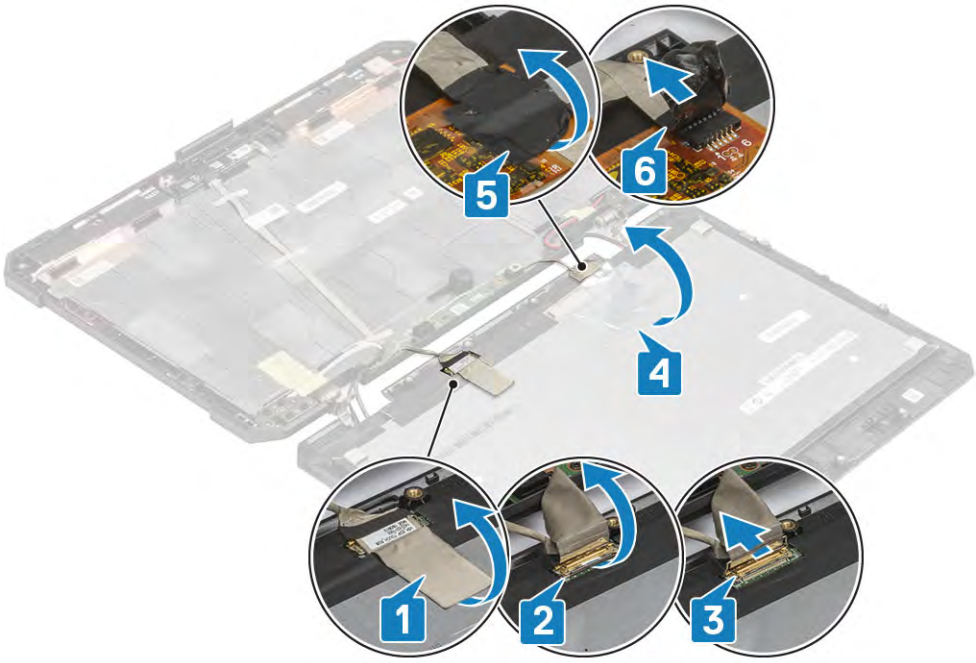
NOTE: A simplified approach to removal of LCD Panel with Bezel assembly as described in Critical Callout doesn't necessarily require the Display Assembly removal. Please use the procedure in order to avoid re-routing the antennae cables.

1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Batteries
   b Bottom Chassis Cover
   c PCIe Heatsink assembly
   d Docking port assembly
   e WLAN Card
   f WWAN Card
   g GPS Board
   h Heatsink
   i Hinge Covers
   j Display Assembly

3 Loosen the 12 M2.5 screws from the back cover.

4 Loosen the four M2.5 epoxy screws securing the bezel to the back cover [1] and pry at bottom edge to separate the two parts. [2]

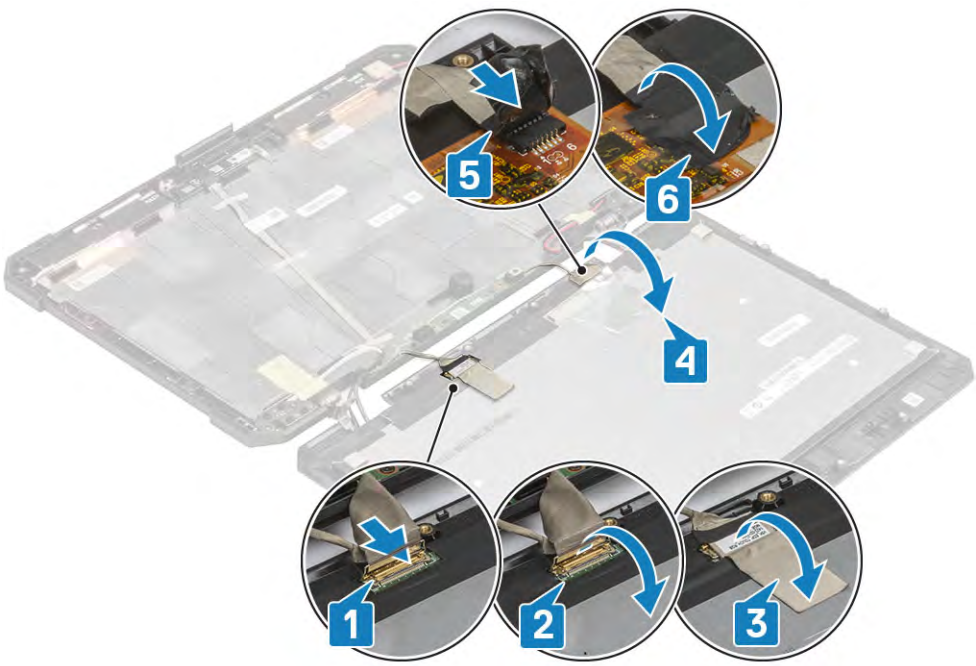
5 Peel off the tape on the LCD and Camera connections [1,4] and open the piano cover [2] to slide the LCD connector [3] and Camera connections out. [4,5]



NOTE: This separates the LCD assembly in two separately orderable components, the LCD Panel Bezel assembly and the LCD Back cover. To know the specifics of the components of the assembly please refer to order details.

Installing the LCD with Bezel and the Display Backcover Assembly

1 Connect the LCD FPC connectors on the touch controller board[1,2] and secure it using a piece of mylar tape. [3]



2 Connect the camera cable [4] and secure it using a tape. [5,6]

3 Align and place the bezel on the back cover [1] and secure it using the four M2.5 epoxy screws. [2]

4 Tighten the 12 M2.5 screws to secure the back cover to the LCD bezel assembly.

5 Install the:

a Display Assembly
b Hinge Covers
c Heatsink
d GPS Card
e WLAN Card
f WWAN Card
g PCIe Heatsink assembly
h Docking port assembly
i Bottom Chassis Cover
j Batteries

6 Follow the procedure in After working inside your computer.

NOTE: Please refer to Critical Callout section for more information about sub-assemblies.

Microphone

Removing the Microphone

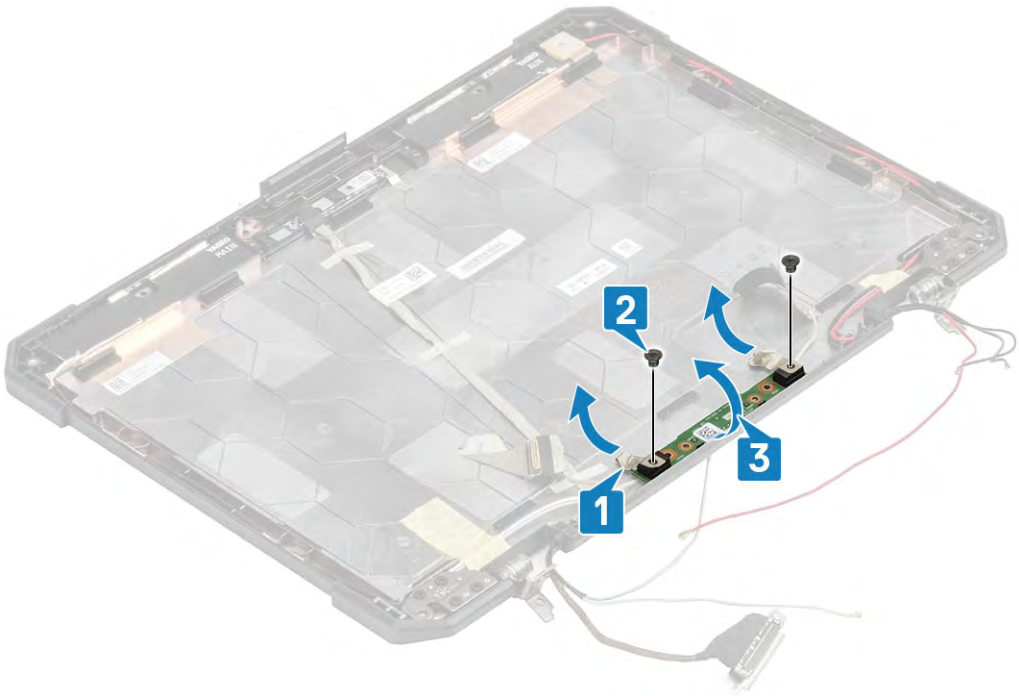
NOTE: A simplified approach to removal of LCD Panel with Bezel assembly as described in Critical Callout doesn't necessarily require the Display Assembly removal. Please use the procedure in order to avoid re-routing the antennae cables.

1 Follow the procedure in Before working inside your computer.

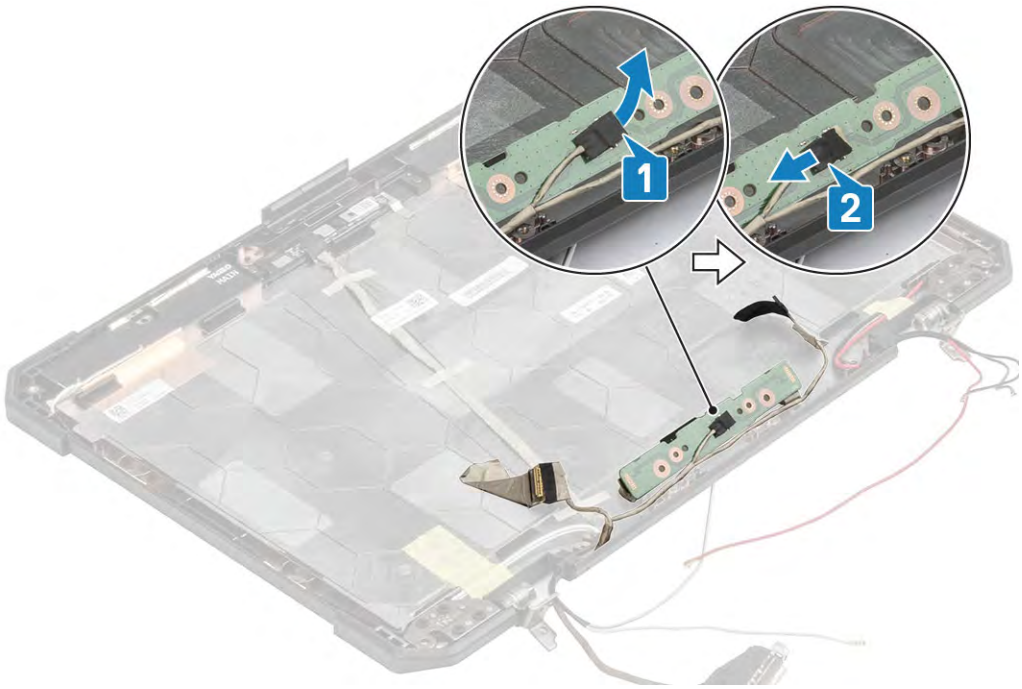
2 Remove the:

- a Batteries
- b Bottom Chassis Cover
- c PCIe Heatsink assembly
- d Docking port assembly
- e WLAN Card
- f WWAN Card
- g GPS Board
- h Memory
- i Heatsink
- j Hinge Covers
- k Display Assembly
- l LCD with Bezel assembly

3 Peel off the tape securing the microphone daughterboard[1] and loosen the two M2*3 screws to flip the daughterboard. [3]

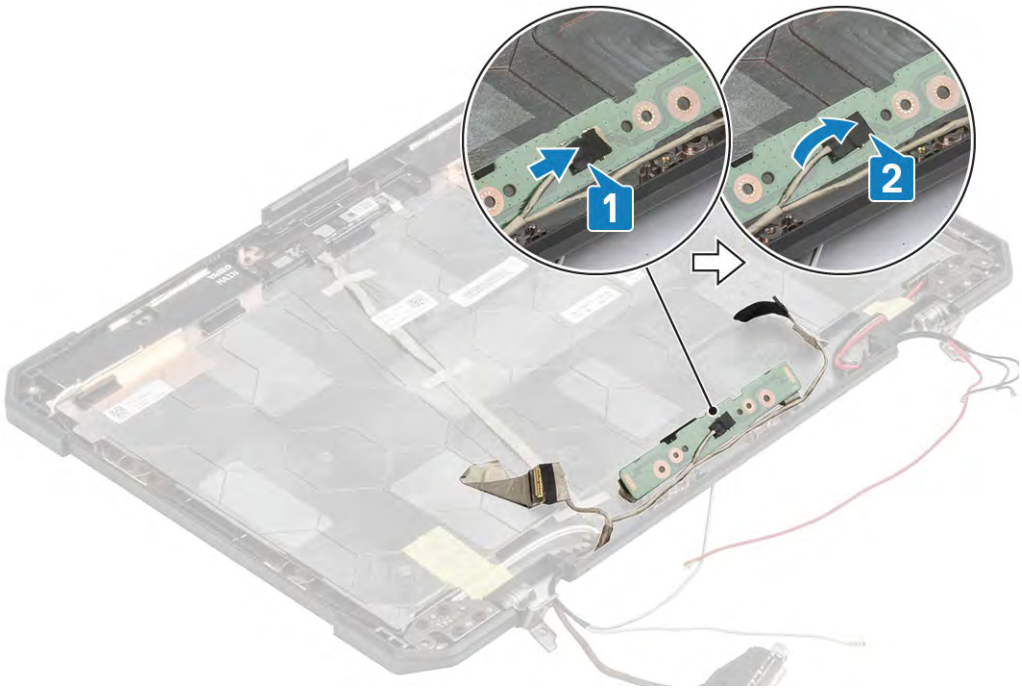


4 Peel off the insulation tape [2] and disconnect the cable connectors.

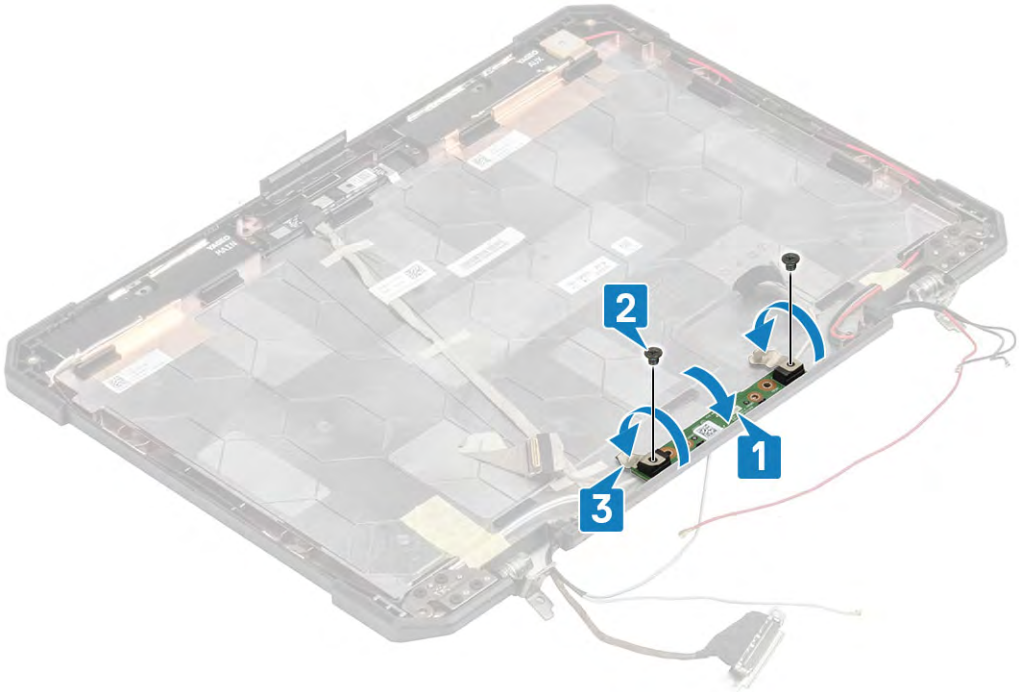


Installing the Microphone

1 Connect the microphone cable to the daughterboard [1] and secure it using a piece of tape. [2]



2 Flip over the daughterboard aligning to the screw posts [1] and tighten the two M2*3 screws [2]



3 Secure the microphone daughterboard using a piece of mylar tape on either sides. [3]

4 Install the:

a LCD Bezel Assembly
b Display Assembly
c Hinge Covers
d Heatsink
e GPS Card
f WLAN Card
g WWAN Card
h PCIe Heatsink assembly
i Docking port assembly
j Bottom Chassis Cover
k Batteries

5 Follow the procedure in After working inside your computer.

Camera

Removing the Camera

NOTE: A simplified approach to removal of LCD Panel with Bezel assembly as described in Critical Callout doesn't necessarily require the Display Assembly removal. Please use the procedure in order to avoid re-routing the antennae cables.

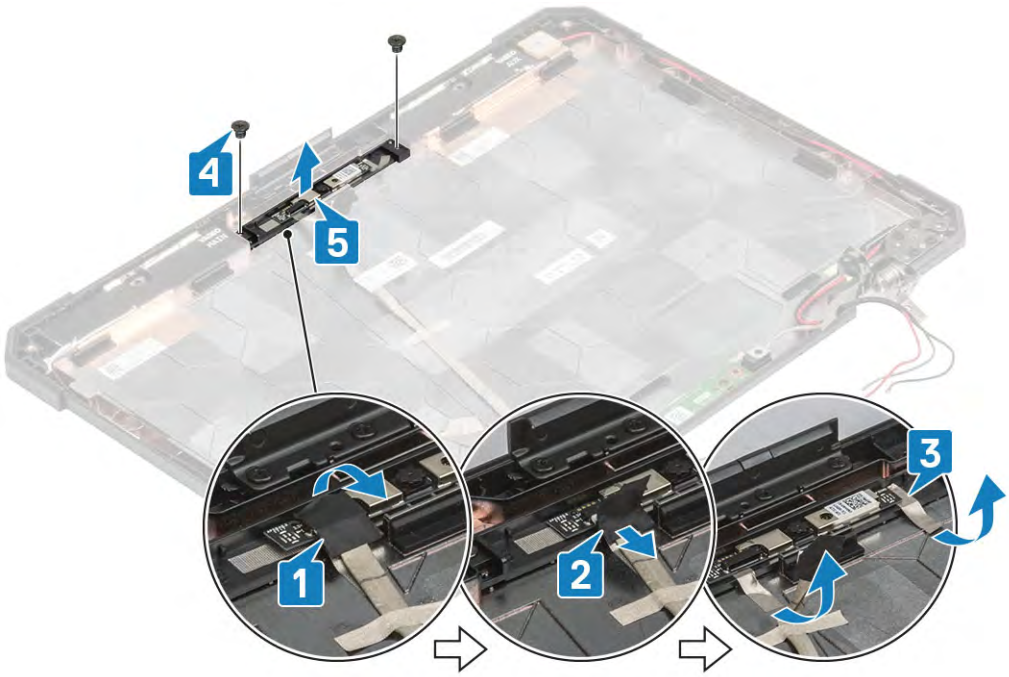
1 Follow the procedure in Before working inside your computer.

2 Remove the:

a Batteries
b Bottom Chassis Cover
c PCIe Heatsink assembly
d Docking port assembly
e WLAN Card
f WWAN Card

g GPS Board
h Heatsink
i Hinge Covers
j Display Assembly
k LCD Bezel and Backcover Assembly

3 Peel off the mylar tape[1] and the tape securing the EDP cable[2] to disconnect the EDP cable from the module. [3]

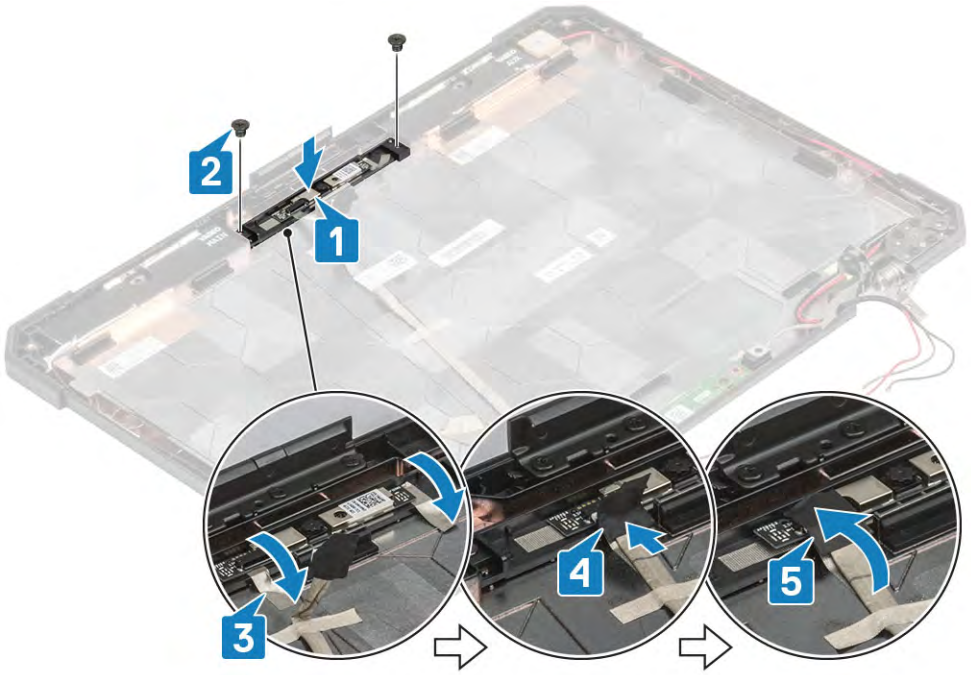


4 Loosen the two M2*3 screws [4] and lift the module away from the LCD with Bezel assembly. [5]

CAUTION: Do not touch the Camera Lens fused to the LCD with Bezel assembly.

Installing the Camera

1 Align and place the Camera module on the screw posts[1] and tighten the two M2*3 screws. [2]
2 Connect the EDP cable to the module[3], stick the tape[4] and secure the module using a piece of mylar tape. [5]



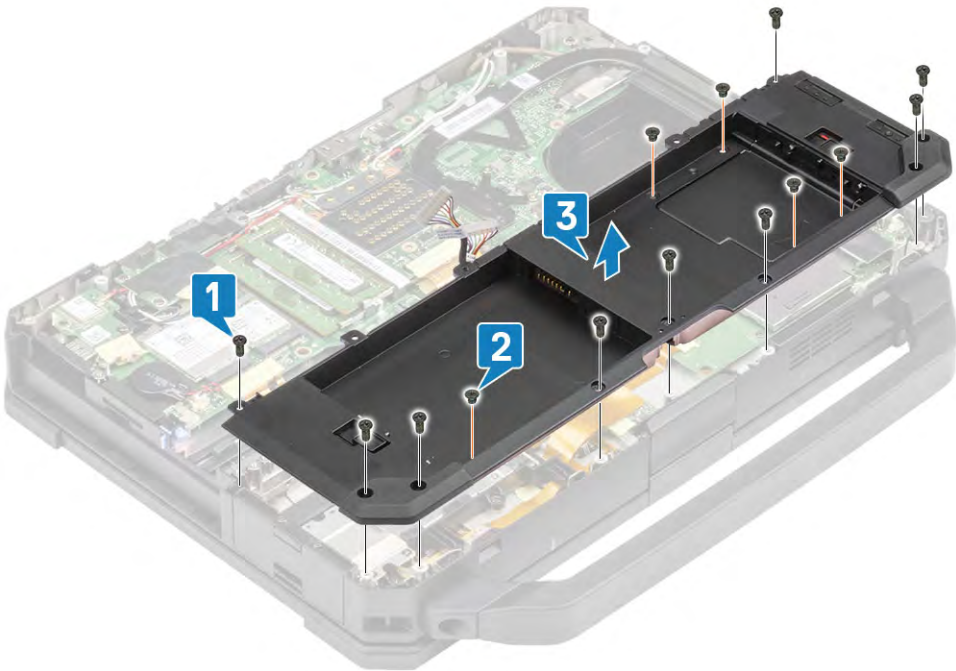
3 Install the:
   a Display Assembly
   b Hinge Covers
   c Heatsink
   d GPS Card
   e WLAN Card
   f WWAN Card
   g PCIe Heatsink assembly
   h Docking port assembly
   i Bottom Chassis Cover
   j Batteries
4 Follow the procedure in After working inside your computer.

Battery Bay

Removing the Battery Bay

1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Batteries
   b Bottom Chassis Cover
   c PCIe Heatsink assembly
3 Disconnect both the batteries connection from the motherboard as shown below.

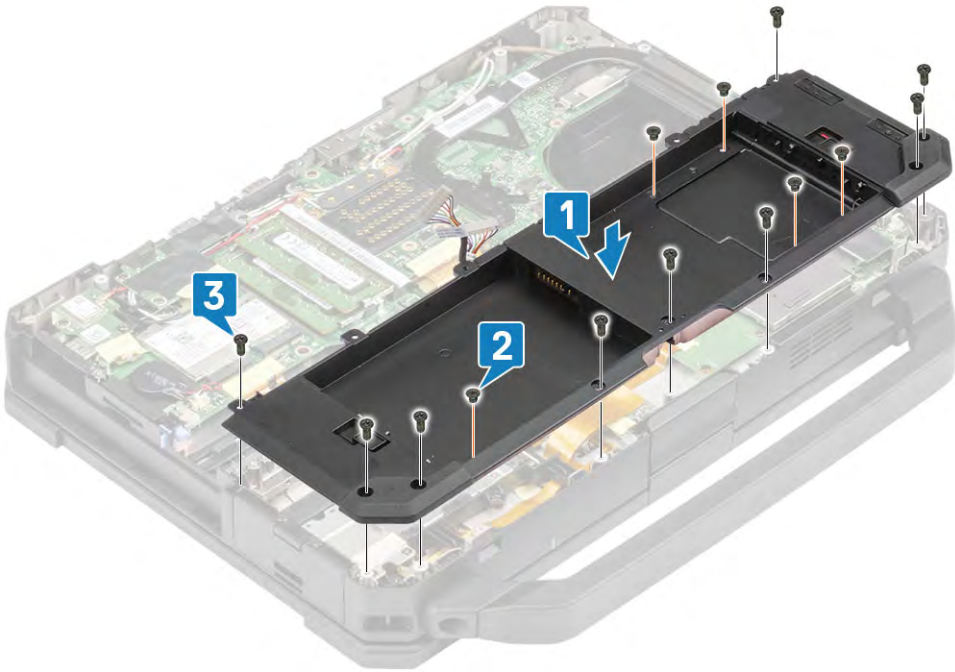
4 Loosen the five M2.5*3 and nine M2.5*5 [2][[3] screws securing the battery bay to palmrest.



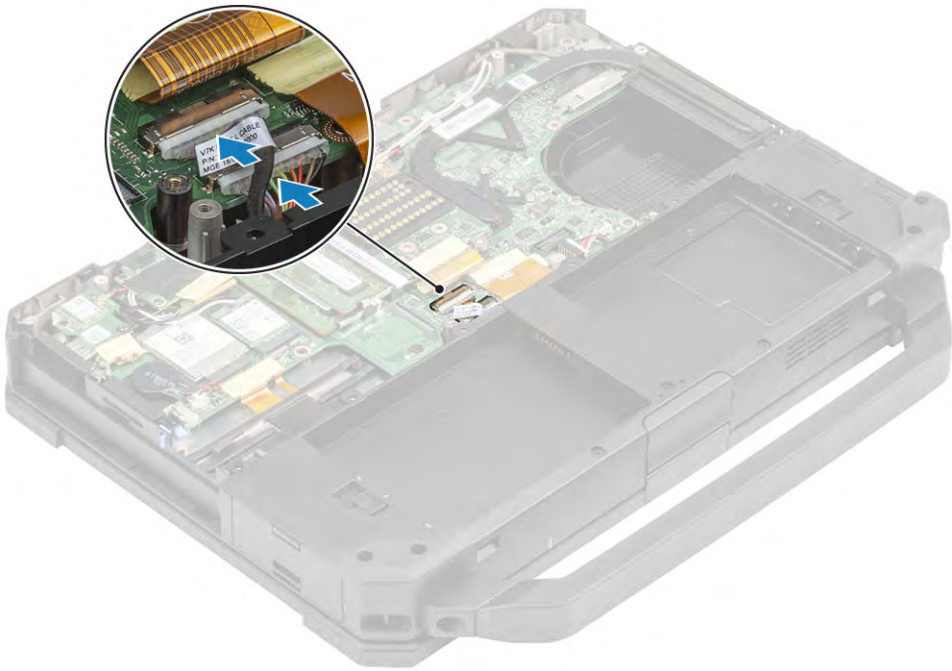
5 Lift the battery bay up away from the system to complete the disassembly. [3]

Installing the Battery Bay

1 Align and place the battery bay on the screw posts[1] and tighten the five M2.5*3 and nine M2.5*5[3]screws. [2]



2 Re-connect the battery cables to the motherboard as shown below.



3 Install the:
   a PCIe Heatsink assembly
   b Batteries
   c Bottom Chassis Cover
4 Follow the procedure in After working inside your computer.

Left I/O board

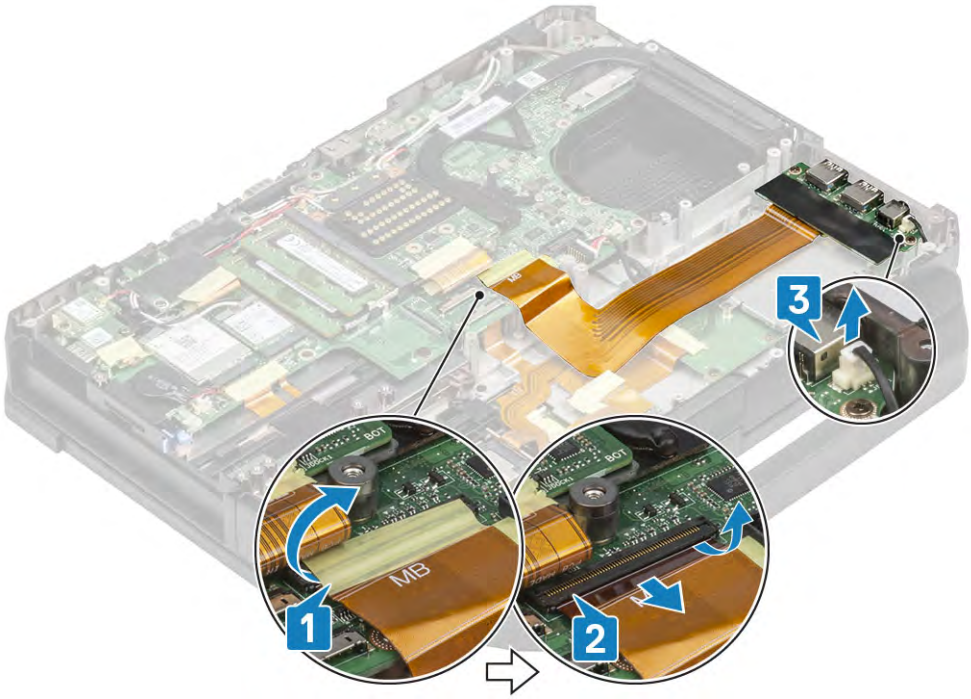
Removing the Left I/O Daughterboard

1 Follow the procedure in Before working inside your computer.

2 Remove the:

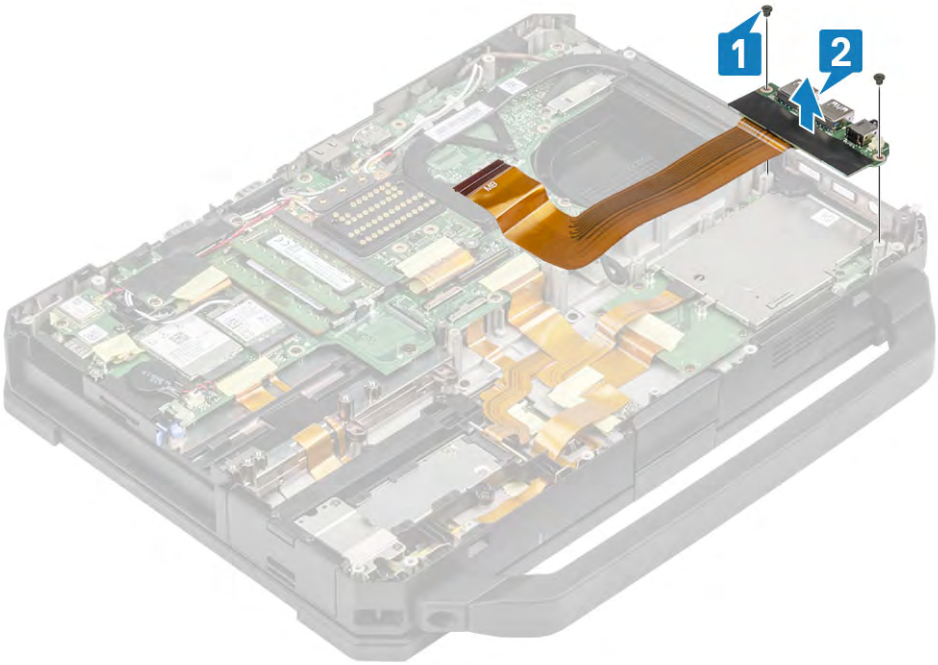
- a Batteries
- b Bottom Chassis Cover
- c PCIe Heatsink Fan Assembly
- d Battery Bay

3 Peel off the inductive tape on the left I/O daughterboard FPC connection on the motherboard [1] and disconnect the same.[2]



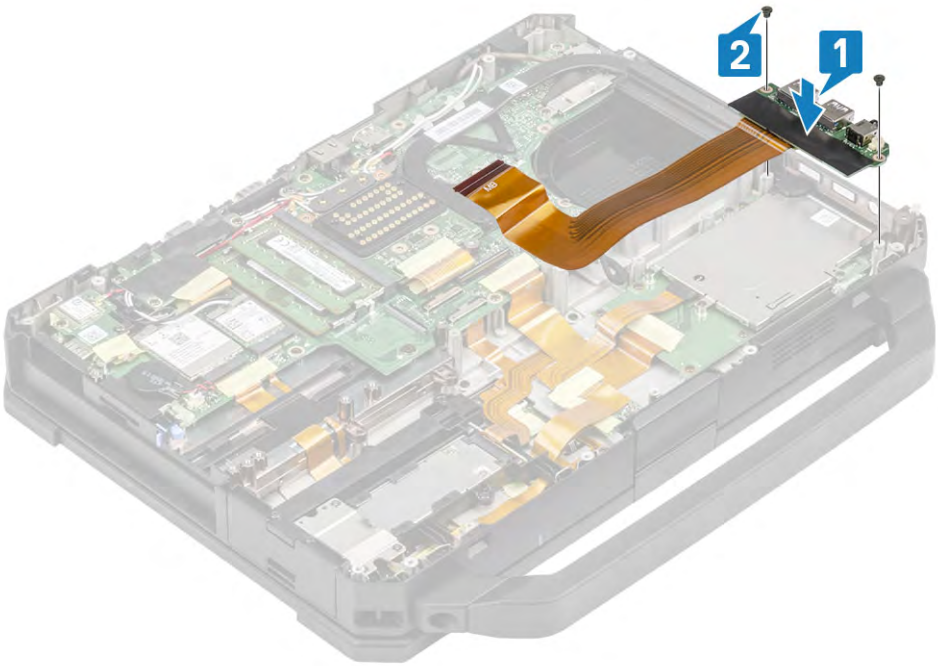
4 Loosen the M2*5 screws and disconnect the Speaker cable connection from the Left I/O daughterboard. [3]

5 Loosen the two M2*3 screws on the Left I/O daughterboard [1] and lift it up to complete the disassembly. [2]

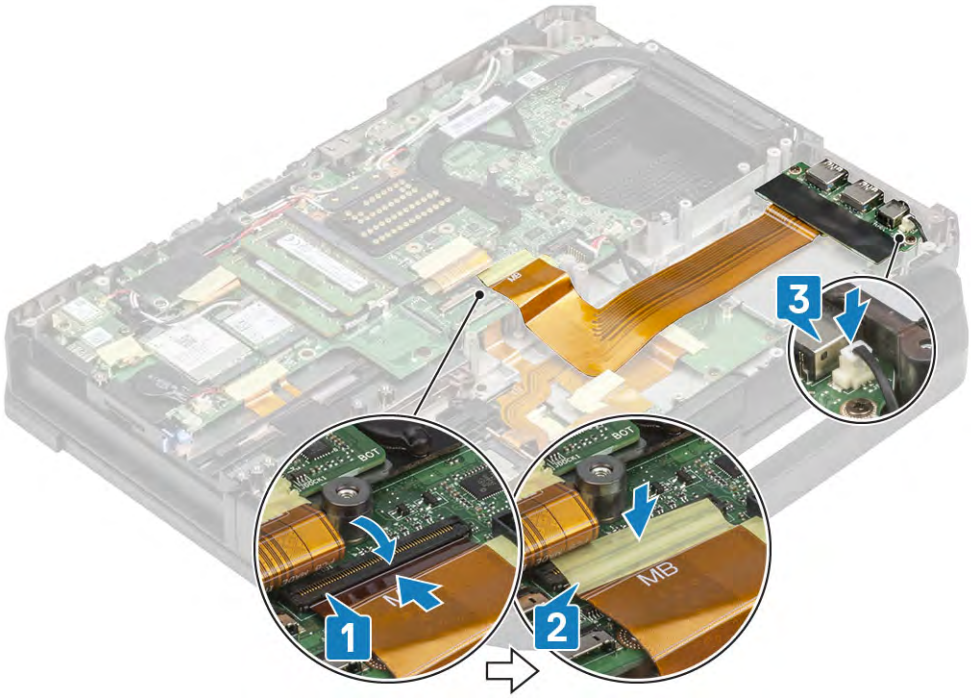


Installing the Left I/O Board

1 Align and place the left I/O daughterboard [1] and secure it using the two M2*3 screws. [2]



2 Connect the FPC to the motherboard [1] and secure it using an insulation tape. [2]



3 Connect the speaker cable to the Left I/O daughterboard and secure it using the two, M2*5 screws. [3]

4 Install the:
   a Battery Bay
   b PCIe Heatsink Fan assembly
   c Bottom chassis cover
   d Batteries

5 Follow the procedure in After working inside your computer.

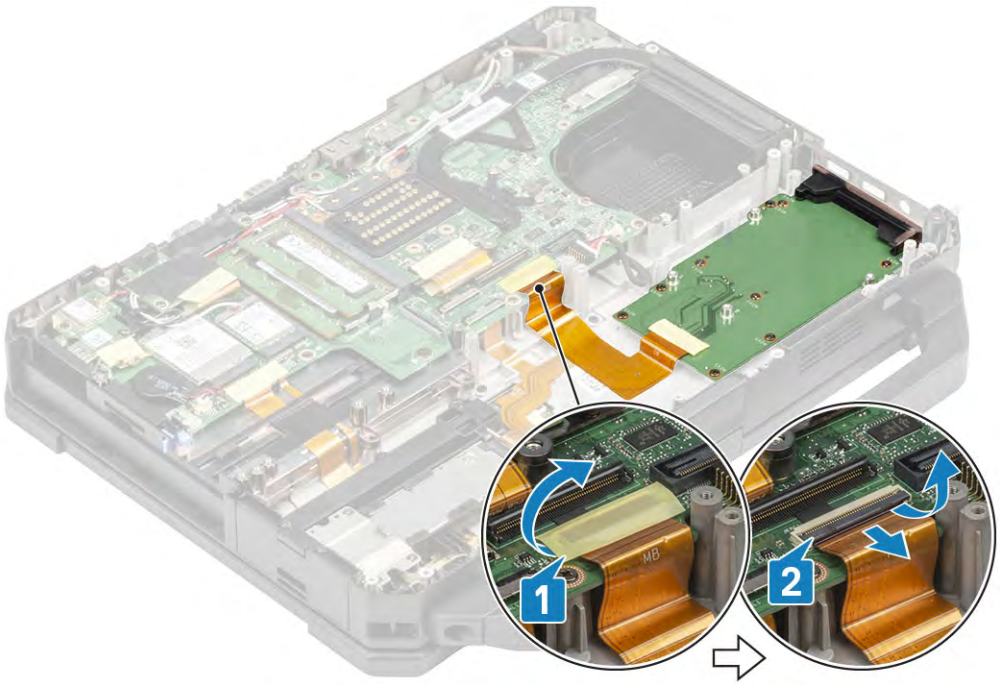
Expresscard

Removing the ExpressCard Reader

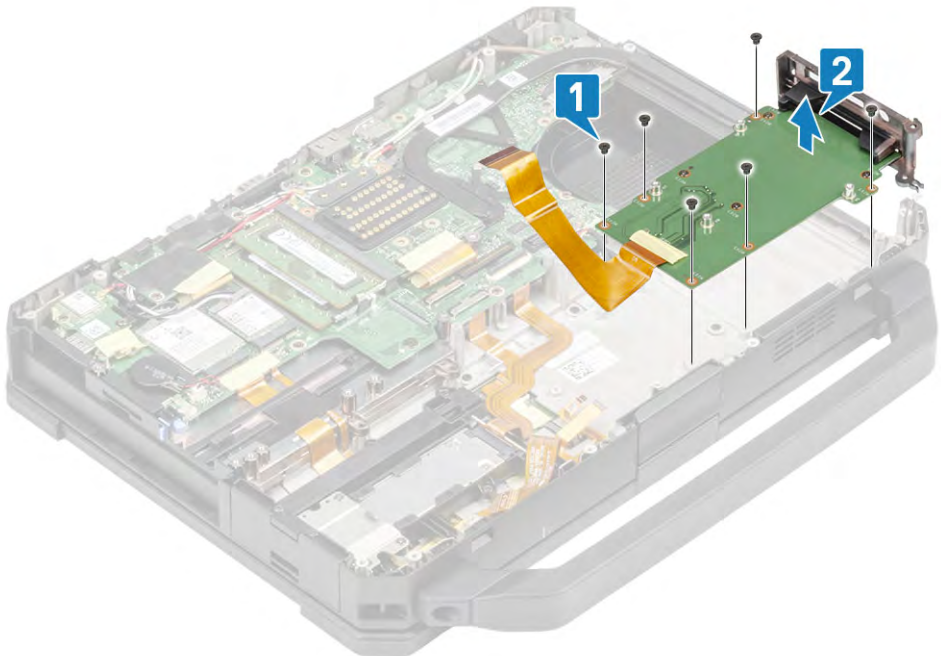
1 Follow the procedure in Before working inside your computer.

2 Remove the:
   a Battery
   b Bottom Chassis Cover
   c PCIe Heatsink assembly
   d Battery Bay
   e Left I/O daughterboard

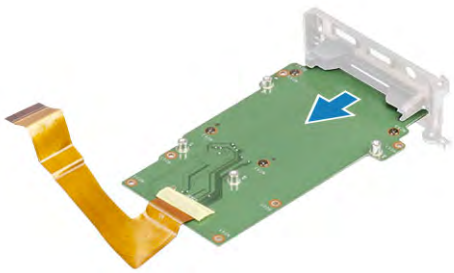
3 Peel off the two set of tapes for the FPC connectors on the motherboard [1,2] and open the piano cover[3] to release the FPC connector. [4]



4 Loosen the six M2*5 screws [1] and lift the daughterboard up to complete the disassembly. [2]

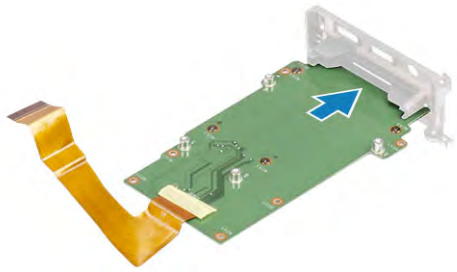


5 Seperate the Express card from the face plate.

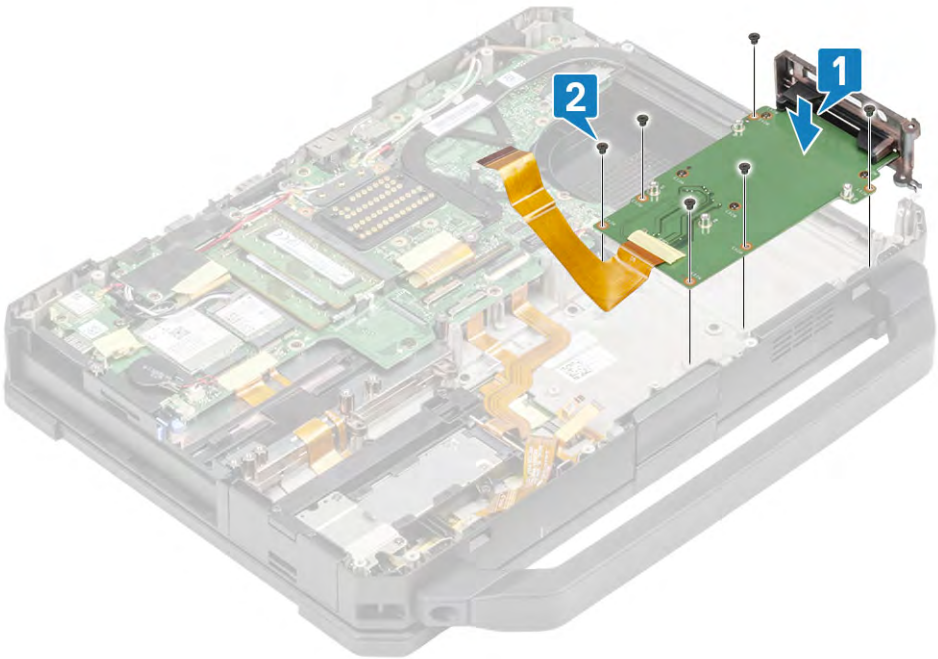


Installing the ExpressCard Reader

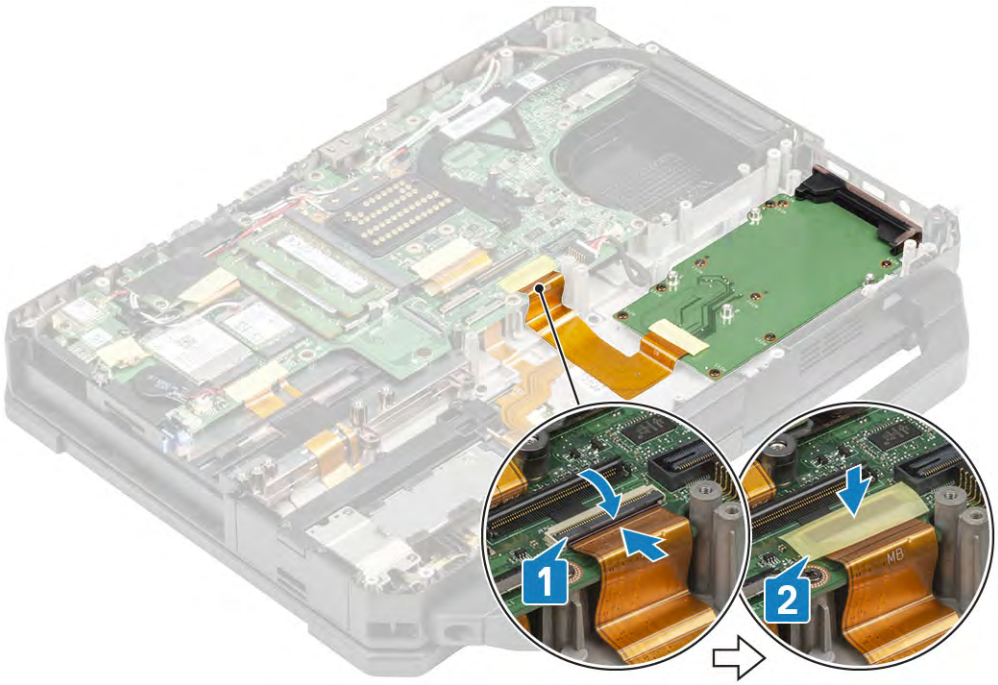
1 Insert the Expresscard reader in the face plate.



2 Align and place the smart card reader [1] and tighten the four M2*5 screws securing the express card reader in it's place.



3 Pass the FPC cable through the wall bridge [1] and open piano cover to insert the FPC cable [2] and secure the connection using the tape on the FPC cable [3] and additional tape over it [4].

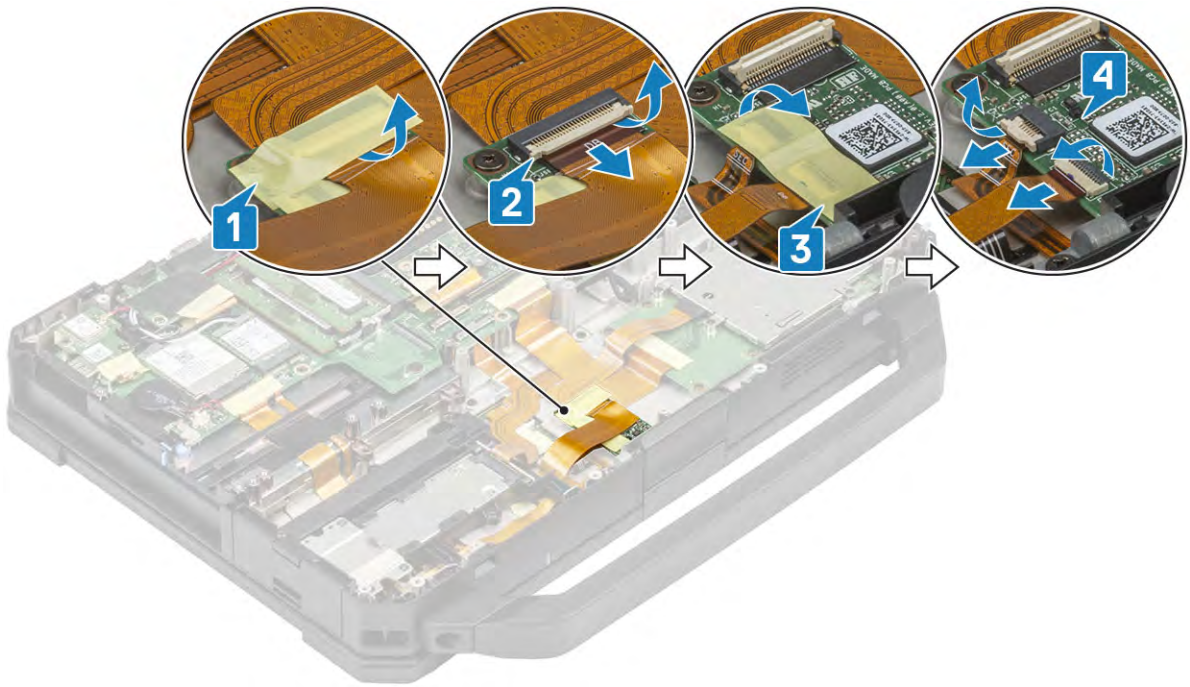


4 Install the:
   a WWAN Card
   b WLAN Card
   c PCIe Heatsink assembly
   d Battery
   e Bottom Chassis Cover
5 Follow the procedure in After working inside your computer.

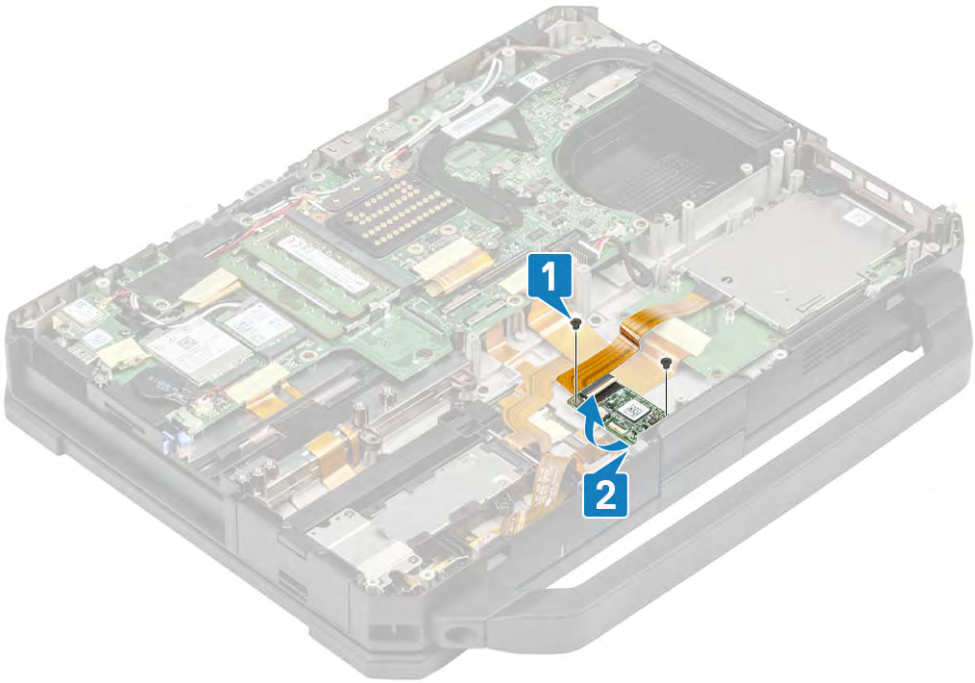
Smart Card

Removing the Smart Card Reader

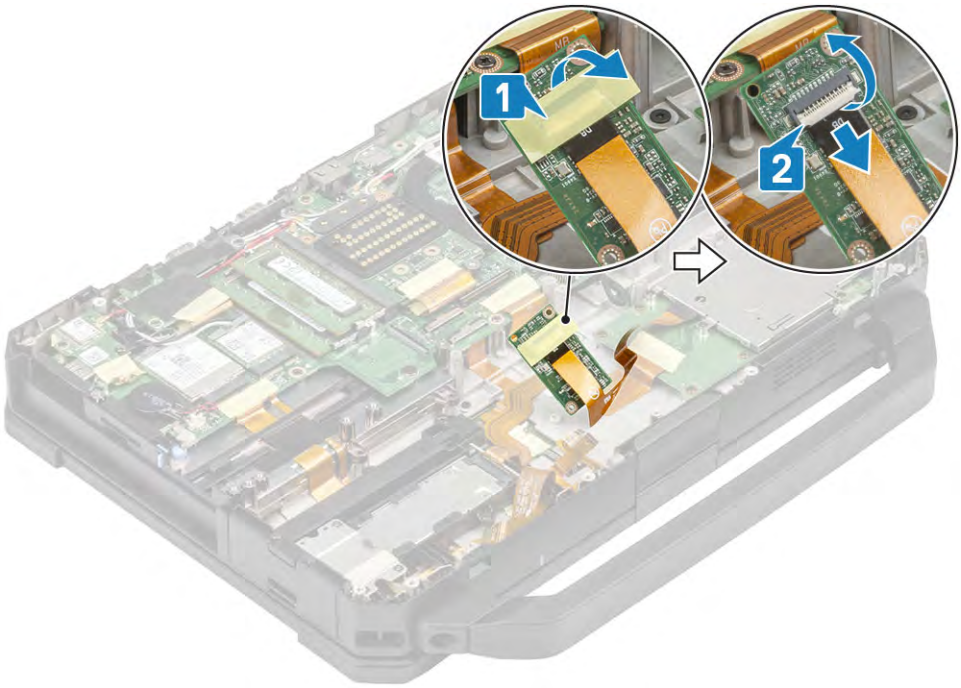
1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Batteries
   b Bottom Chassis Cover
   c PCIe Heatsink assembly
   d Battery Bay
3 Remove the tape [1,3] and flip open the fingerprint reader FPC connector[2,4] from the USH board. [4]



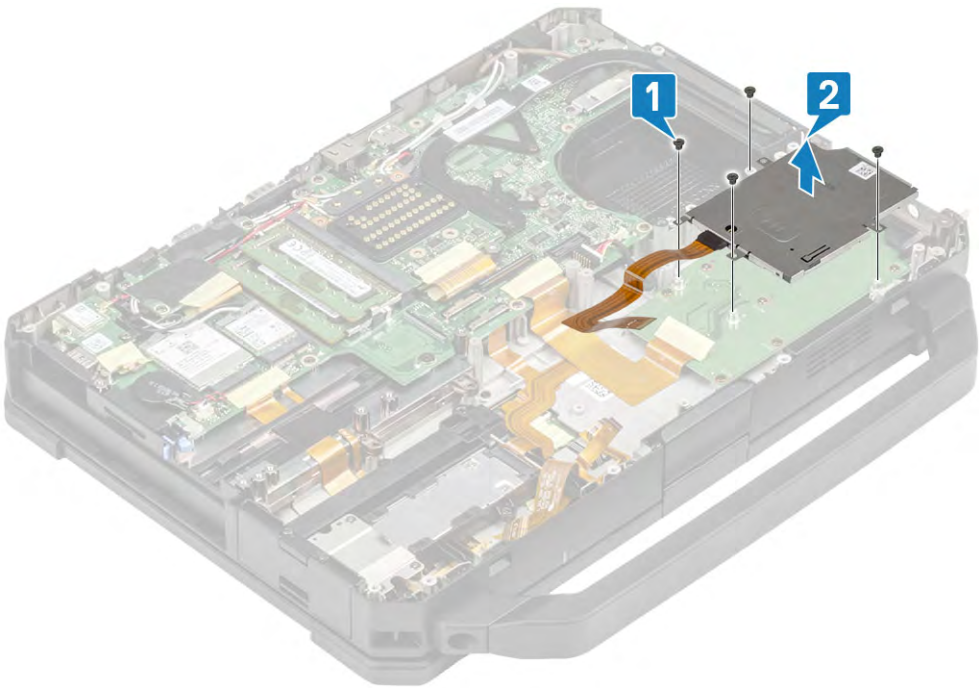
4 Loosen the two M2*3 screws [1] securing the USH board to the bottom chassis and flip it over.[2]



5 Remove the tape [1] and disconnect the Smartcard Reader FPC. [2]



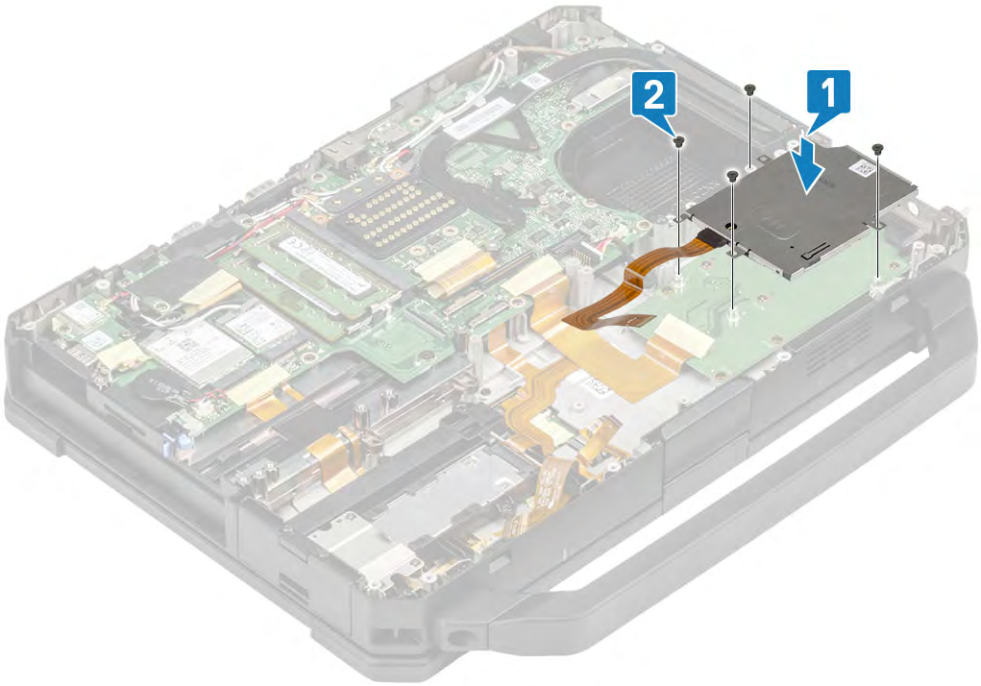
6 Loosen the four M2*3 screws. [1]



7 Lift the smart card reader up to complete the disassembly. [2]

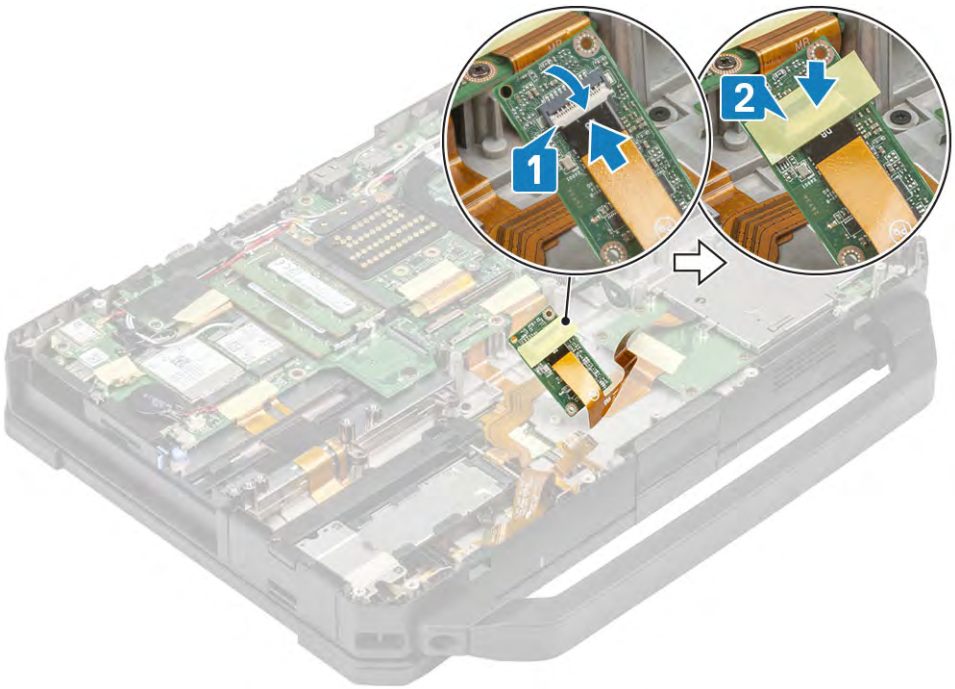
Installing the Smart Card Reader

1 Align and place the smart card reader on the face plate. [1]

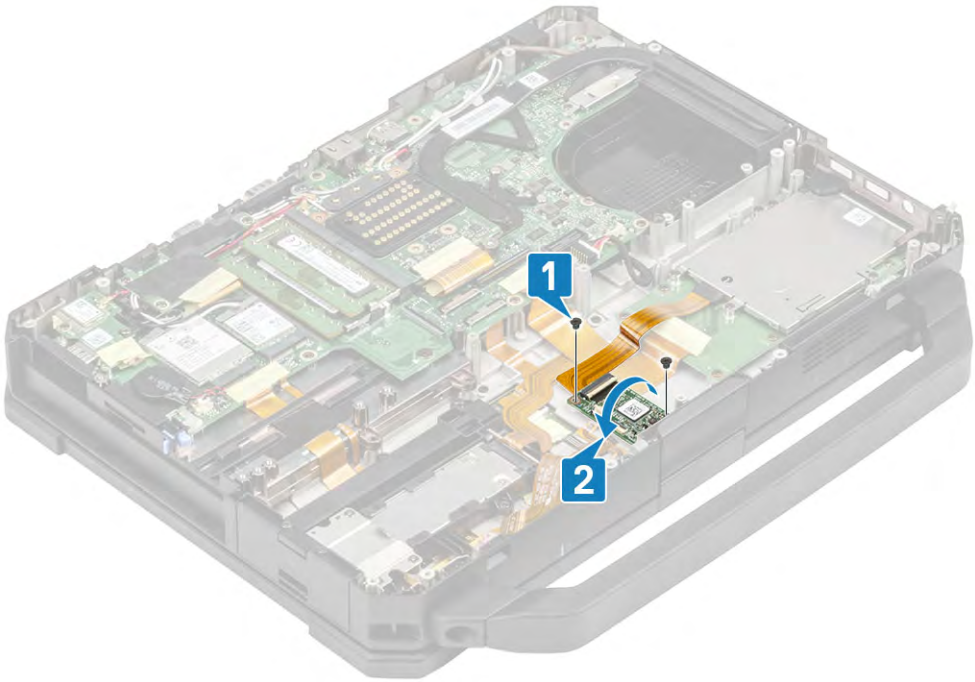


2 Tighten the four M2*3 screws to secure the Smart card reader to the bottom chassis.

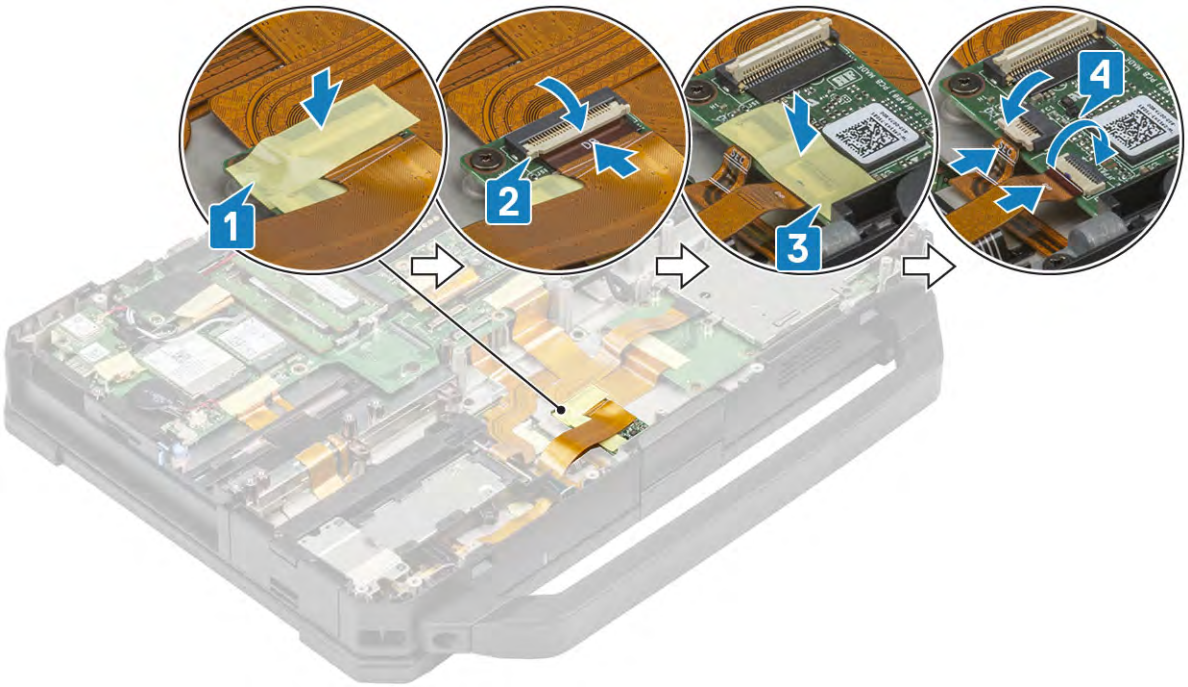
3 Connect the Smart Card FPC on the underside of the USH board [1] and secure it using a piece of tape. [2]



4 Tighten the two M2*3 screws [1] to secure the USH board to the chassis. [2]



5 Reconnect the Smart card FPC connector [1] on the USH board [2] and close the connector securely[3] and secure it using a piece of tape. [4]



6 Install the:

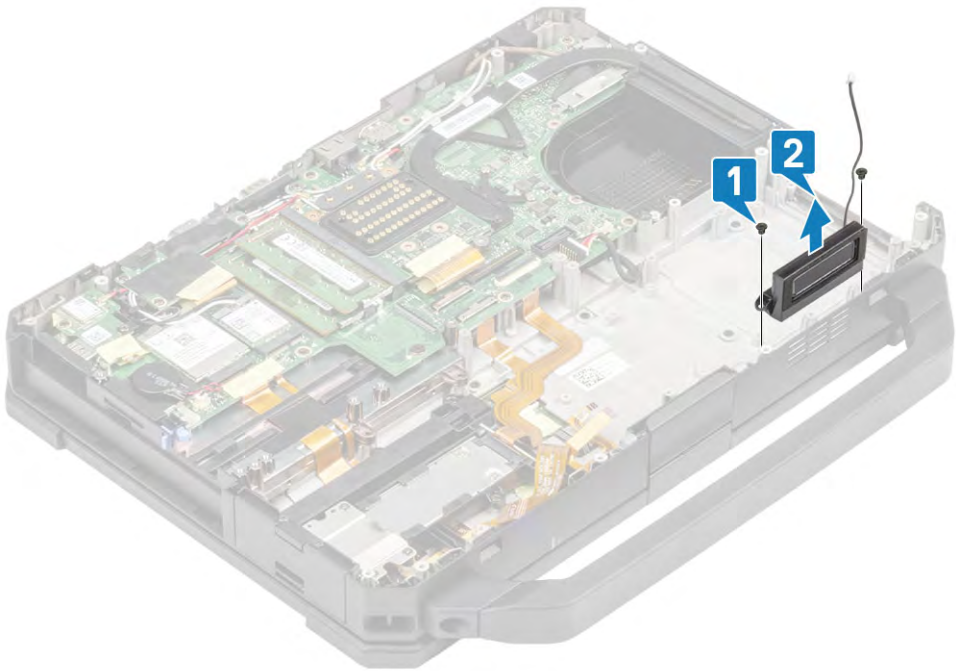
a Battery Bay
b PCIe Heatsink assembly
c Bottom Chassis Cover
d Batteries

7 Follow the procedure in After working inside your computer.

Speaker

Removing the Speaker

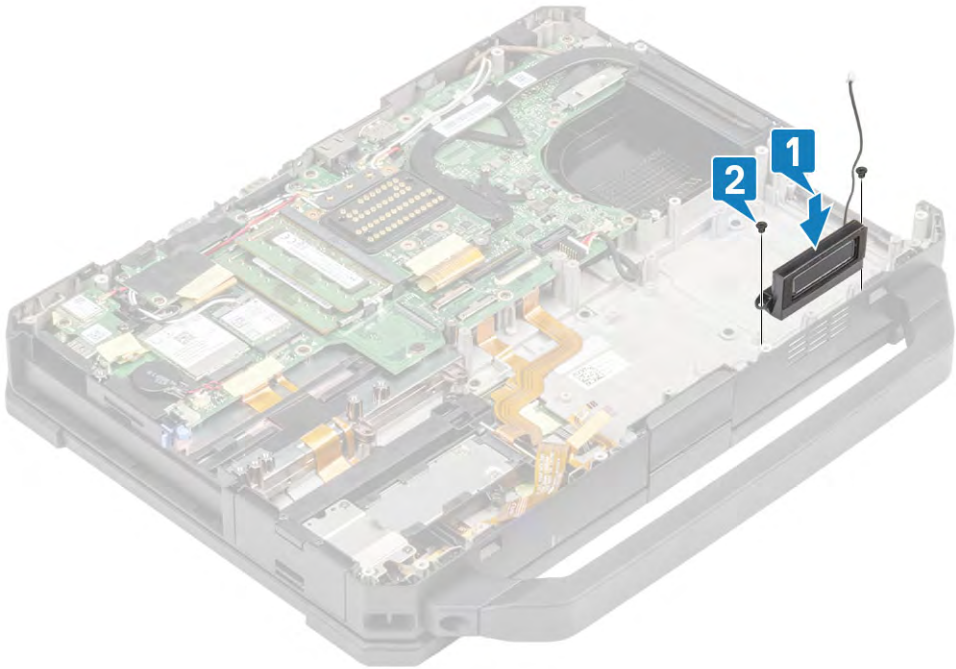
1 Follow the procedure in Before working inside your computer.
2 Remove the:
   a Battery
   b Bottom Chassis Cover
   c PCIe Heatsink assembly
   d Handle
   e Left I/O daughterboard
3 Loosen the two M2.5*7 screws. [1]



4 Lift the speaker up to remove it from the machine. [2]

Installing the Speaker

1 Align and place the speakers along the screw grooves. [1]



2 Tighten the two M2.5*7 screws to secure the speaker in it's place. [2]

3 Install the:

a Handle
b Left I/O daughterboard
c PCIe Heatsink assembly
d Docking port assembly
e Bottom Chassis Cover
f Batteries

4 Follow the procedure in After working inside your computer.

System board

Removing the Motherboard

NOTE: A simplified approach to motherboard disassembly is described in the Critical Callout out section.

NOTE: This system cannot be disassembled further. To access underlying components kindly order the base as per order details.

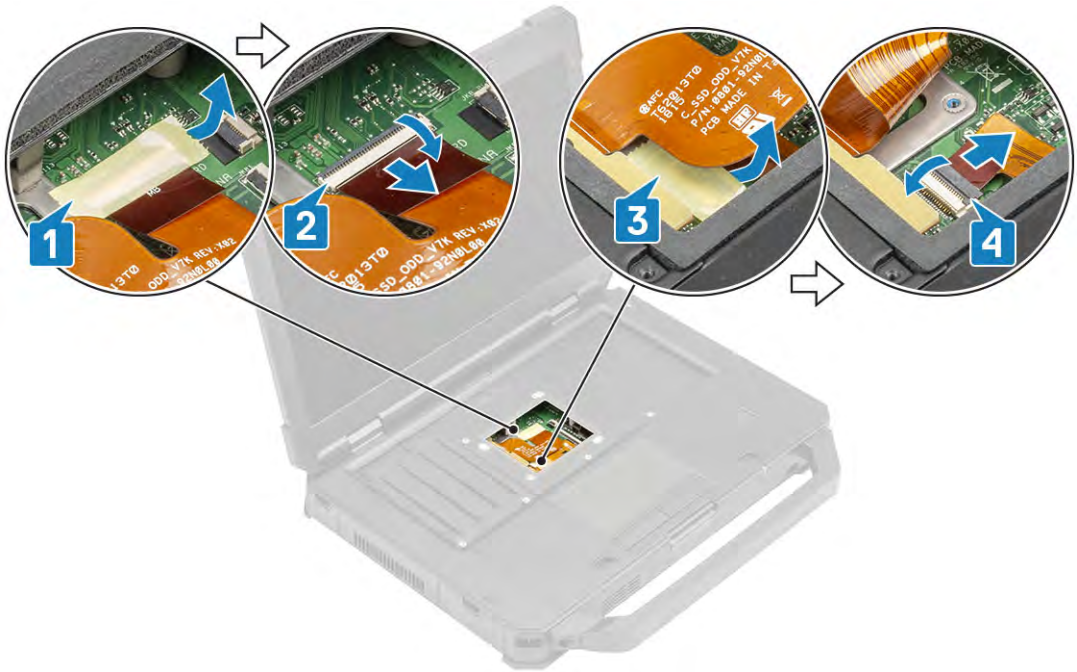
1 Follow the procedure in Before working inside your computer.

2 Remove the:

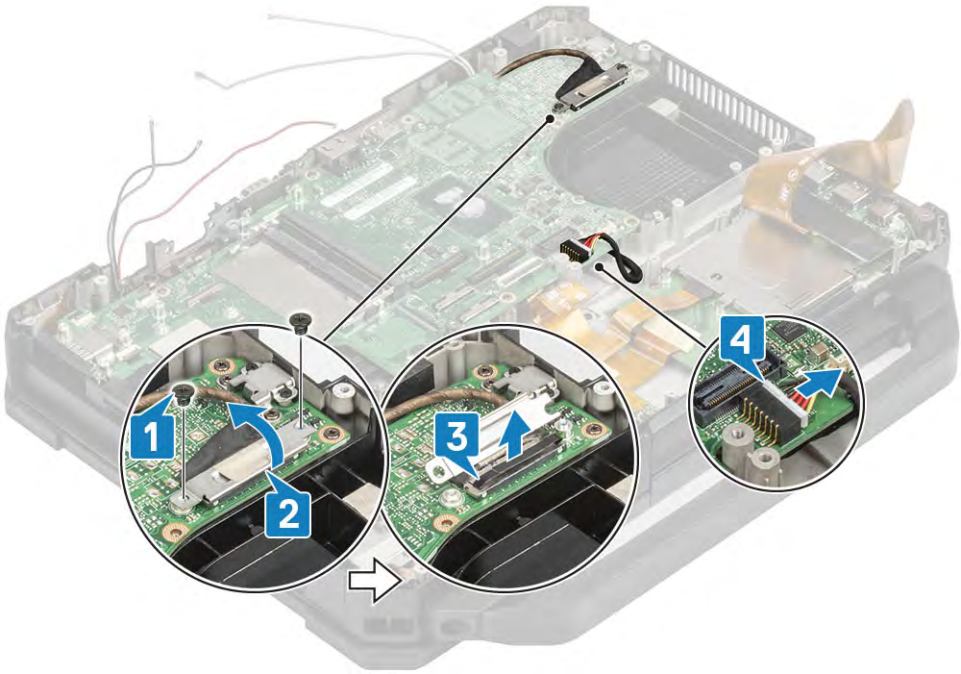
a Battery
b Bottom Chassis Cover
c Keyboard
d Battery Bay
e PCIe Heatsink
f Primary SSD
g Secondary SSD
h Heat Sink
i Primary SSD Rail
j WWAN Card
k WLAN Card

l GPS Module
m Memory
n Rear I/O board
o Docking Port Assembly

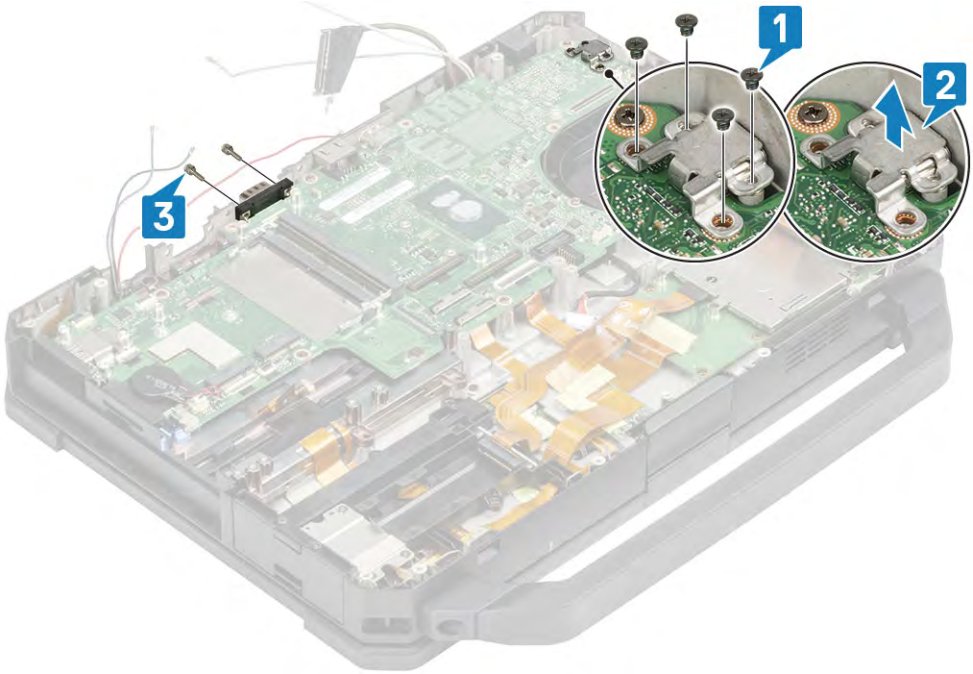
3 Peel off the tape [1,3] and disconnect the SSD-ODD PCB [2] and touch-pad connections from the motherboard. [4]



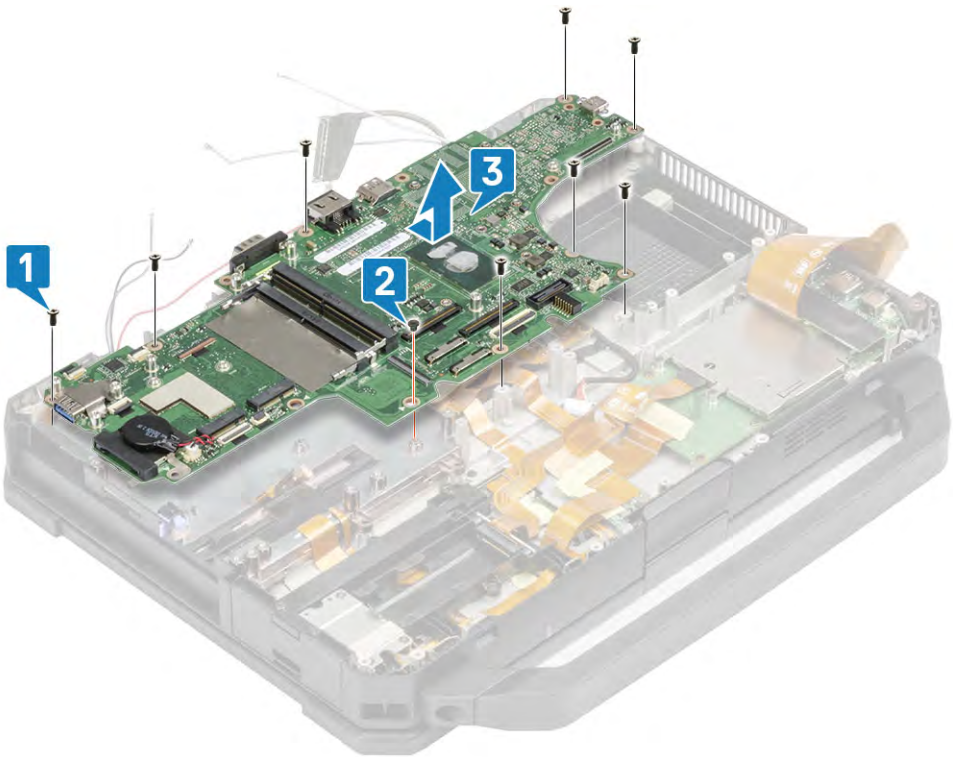
4 Loosen the two M2*3 screws[1] to flip over the EDP bracket [2] and disconnect the EDP cable [3] and disconnect the DC-In connector [4] .



5 Loosen the four M2.5*5 screws to remove the USB Type-C bracket [1] to remove the bracket [2] and remove the two cap screws in the rear I/O space. [3]

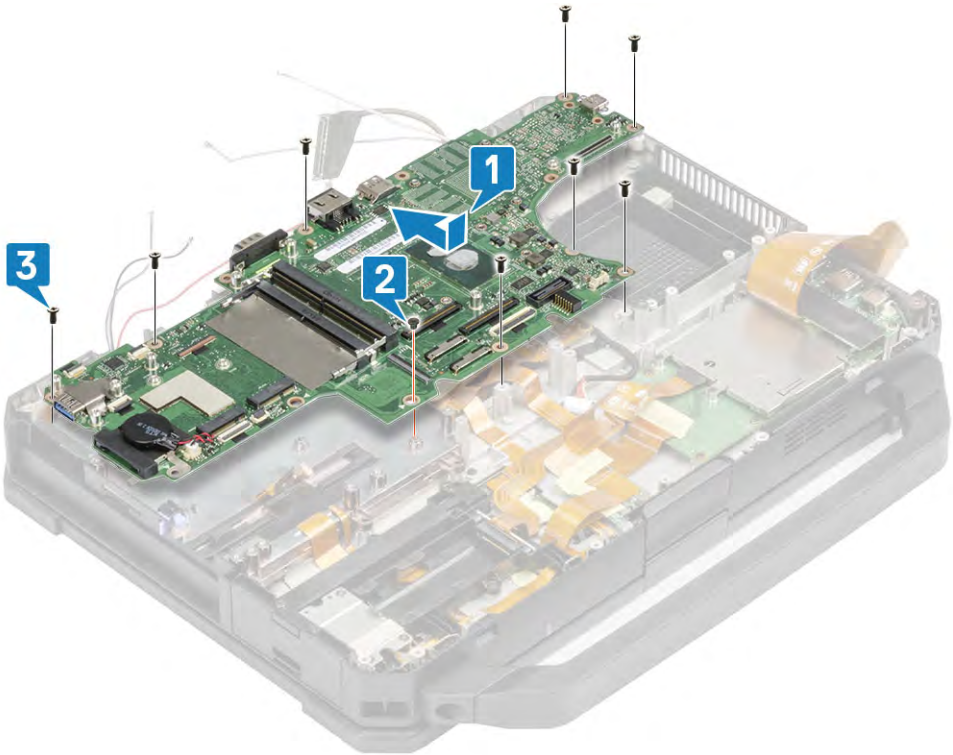


6 Loosen the nine M2.5 screws [1] and two epoxy screws [2] and lift the system board. [3]

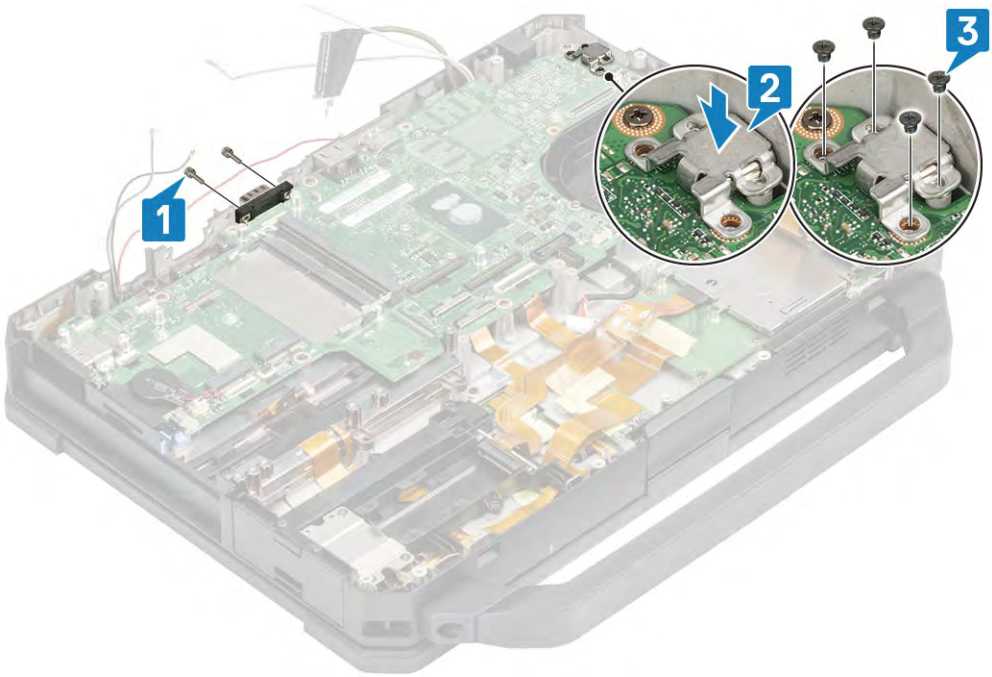


Installing the Motherboard

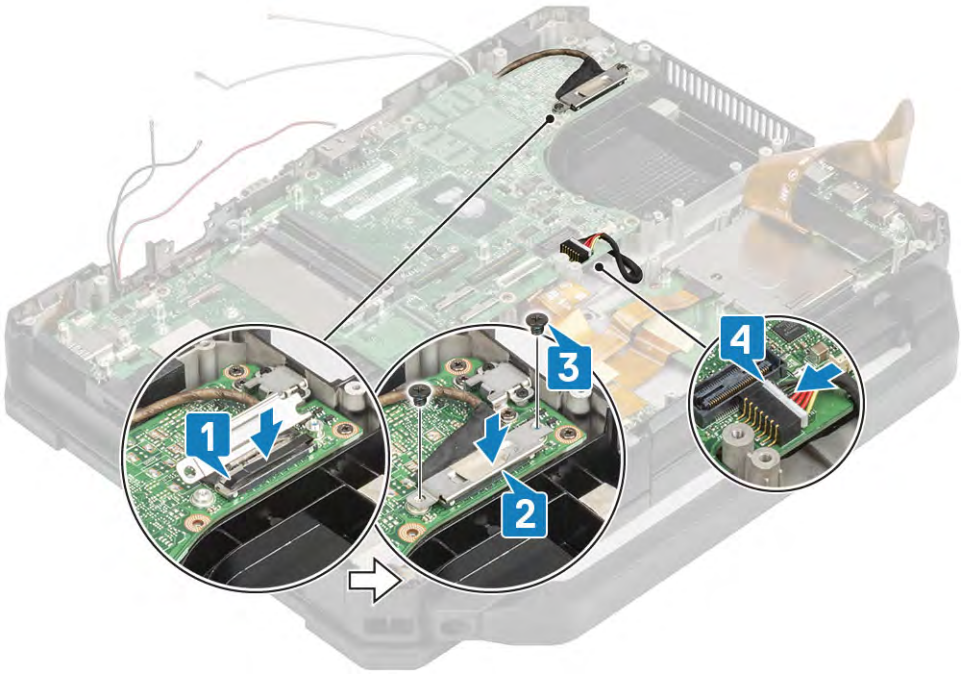
1 Align and tighten the nine M2.5 screws [1] and two epoxy screws [2]



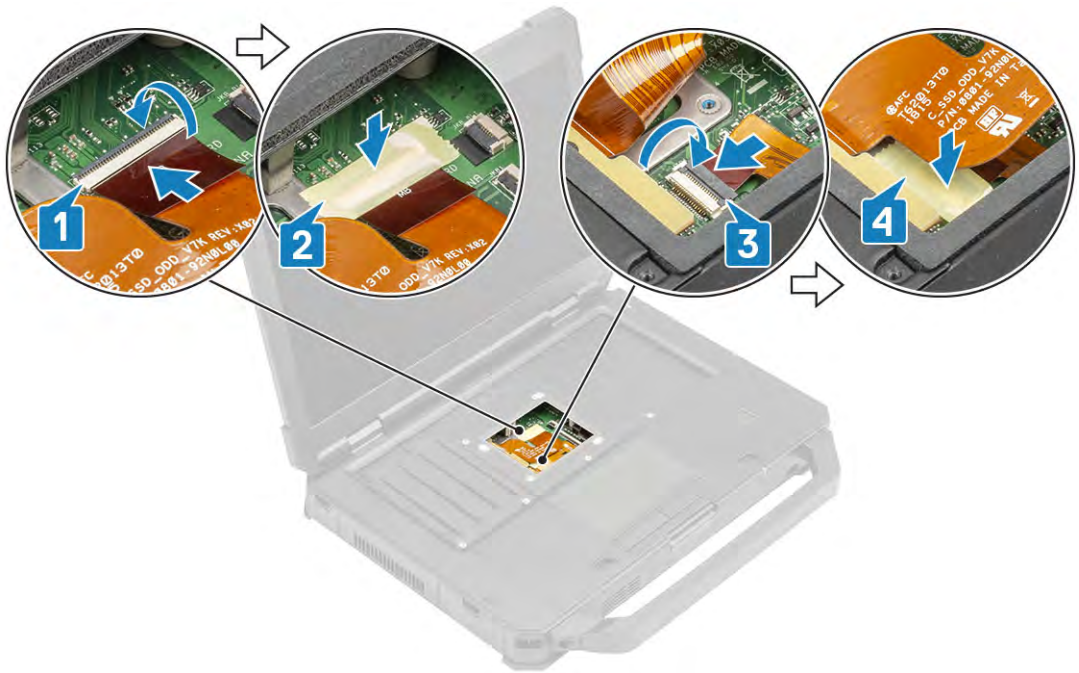
2 Tighten the two cap screws 3 and place the USB Type-C bracket on the screw posts and tighten the four M2.5*5 screws [1,2]



3 Connect the EDP cable [1] and flip over the EDP bracket on the screw posts [2], tighten the two M2*3 screws [3] and connect the DC-In cable .



4 Connect the connect the SSD-ODD PCB [1] and touch-pad connections from the motherboard [3] and secure it using a tape [2,4]



5 Install the:

a Memory
b Secondary SSD
c Primary SSD
d Primary SSD Rail
e GPS Module
f WWAN Card
g WLAN Card
h Heatsink Assembly
i PCIe Heatsink Assembly
j Docking Port Assembly
k Rear I/O Board

l Battery Bay
m Keyboard
n Bottom Chassis Cover
o Batteries

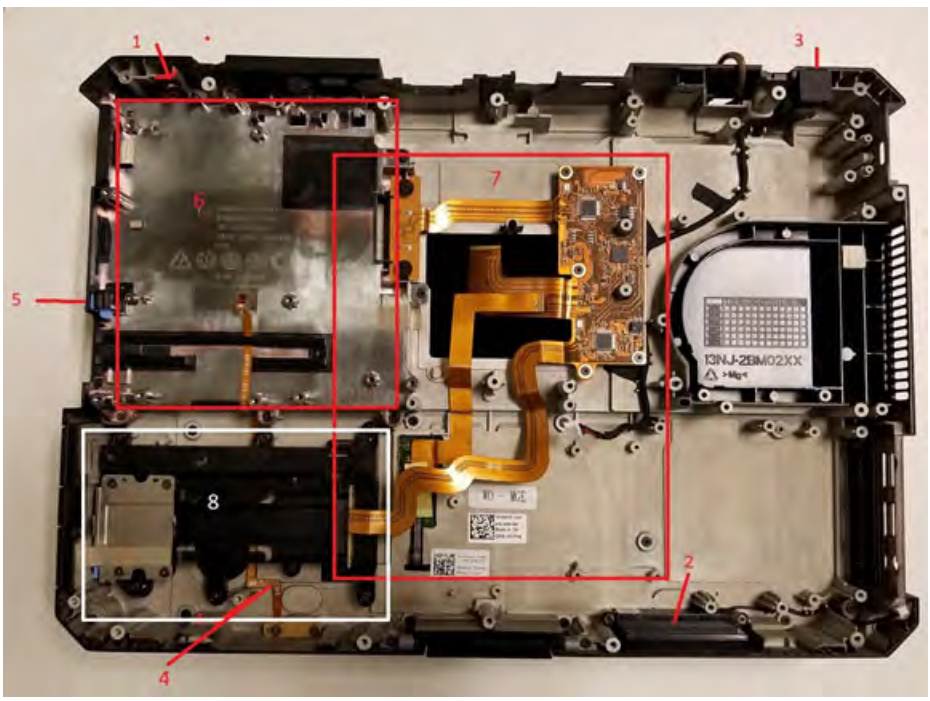
6 Follow the procedure in After working inside your computer.

Bottom Base Assembly

1 To replace the bottom base assembly, remove the :

a Batteries
b Bottom Chassis Cover
c PCIe Heatsink assembly
d Docking port assembly
e WLAN Card
f WWAN Card
g GPS Board
h Memory
i Heatsink
j Primary SSD Rail
k Motherboard
l Display Assembly
m Optical Drive

2 Transfer the components from old base to the new base assembly.



NOTE: Please refer to order details for exact specifics of sub-components defined in the Bottom Chassis Assembly.

NOTE: Latitude 5424, shipped with no Optical Drive has the blank fused to the chassis and for power button issues, the base assembly needs to be replaced.

3 Install the:

a Optical Drive
b Display Assembly

c Motherboard
d Primary SSD Rail
e Heatsink
f Memory
g GPS Card
h WLAN Card
i WWAN Card
j PCIe Heatsink assembly
k Docking port assembly
l Bottom Chassis Cover
m Batteries

4 Follow the procedure in After working inside your computer.

6

BIOS overview

CAUTION: Unless you are an expert computer user, do not change the settings in the BIOS Setup program. Certain changes can make your computer work incorrectly.

NOTE: Before you change BIOS Setup program, it is recommended that you write down the BIOS Setup program screen information for future reference.

Use the BIOS Setup program for the following purposes:

- Get information about the hardware installed in your computer, such as the amount of RAM and the size of the hard drive.
- Change the system configuration information.
- Set or change a user-selectable option, such as the user password, type of hard drive installed, and enabling or disabling base devices.

Topics:

Boot menu

Press <F12> when the Dell logo appears to initiate a one-time boot menu with a list of the valid boot devices for the system. Diagnostics and BIOS Setup options are also included in this menu. The devices listed on the boot menu depend on the bootable devices in the system. This menu is useful when you are attempting to boot to a particular device or to bring up the diagnostics for the system. Using the boot menu does not make any changes to the boot order stored in the BIOS.

The options are:

- UEFI Boot:
  - Windows Boot Manager
-
- Other Options:
  - BIOS Setup
  - BIOS Flash Update
  - Diagnostics
  - Change Boot Mode Settings

Navigation keys

NOTE: For most of the System Setup options, changes that you make are recorded but do not take effect until you restart the system.

Keys	Navigation
Up arrow	Moves to the previous field.

Keys	Navigation
Down arrow	Moves to the next field.
Enter	Selects a value in the selected field (if applicable) or follow the link in the field.
Spacebar	Expands or collapses a drop-down list, if applicable.
Tab	Moves to the next focus area. **NOTE: For the standard graphics browser only.**
Esc	Moves to the previous page until you view the main screen. Pressing Esc in the main screen displays a message that prompts you to save any unsaved changes and restarts the system.

System setup options

NOTE: Depending on the notebook and its installed devices, the items listed in this section may or may not appear.

General options

Table 56. General

Option	Description
System Information	This section lists the primary hardware features of your computer. The options are: · **System Information** · **Memory Configuration** · **Processor Information** · **Device Information**
Battery Information	Displays the battery status and the type of AC adapter connected to the computer.
Boot Sequence	Allows you to change the order in which the computer attempts to find an operating system. The options are: · **Windows Boot Manager** · **Boot List Option:** Allows you to change the boot list options. Click one of the following options: – **Legacy External Devices** – **UEFI**—Default
Advanced Boot Options	Allows you to Enable Legacy Option ROMs. The options are: · **Enable Legacy Option ROMs**—Default · **Enable Attempt Legacy Boot**

Option	Description
UEFI Boot Path Security	Allows you to control whether the system prompts the user to enter the Admin password when booting to a UEFI boot path. Click one of the following options: · **Always, Except Internal HDD**—Default · **Always** · **Never**
Date/Time	Allows you to set the date and time. The change to the system date and time takes effect immediately.

System configuration

Table 57. System Configuration

Option	Description
Integrated NIC	Allows you to configure the integrated network controller. Click one of the following options: · **Disabled** · **Enabled** · **Enabled w/PXE**—Default
Onboard Unmanaged NIC	Allows you to enable / disable onboard USB LAN controller.
Serial Port 1 **Serial Port 2**	Allows you to configure(disable and re-mapping) the serial port(s). Click one of the following options: · **Disabled** · **Com1**—Default (Port is configured with 3F8h with IRQ 4 · **Com3** (Port is configured with 3E8h with IRQ 4 **NOTE: Serial Port 2 is available when the system has Serial Port in the rear configurable I/O space.**
SATA Operation	Allows you to configure the operating mode of the integrated SATA hard-drive controller. Click one of the following options: · **Disabled** · **AHCI** · **RAID On**—Default **NOTE: SATA is configured to support RAID mode.**
SMART Reporting	This field controls whether hard drive errors for integrated drives are reported during system startup. This technology is part of the S.M.A.R.T (Self Monitoring Analysis and Reporting Technology) specification. This option is disabled by default. · **Enable SMART Reporting**

Option	Description
USB Configuration	Allows you to enable or disable the internal/integrated USB configuration. The options are: · **Enable USB Boot Support** · **Enable External USB Ports** · **Disable Docking Station Devices except video (Default : Unchecked)** Rest all the options are set by default. **NOTE: USB keyboard and mouse always work in the BIOS setup irrespective of these settings.**
USB PowerShare	This field configures the USB PowerShare feature behavior. This option allows you to charge external devices using the stored system battery power through the USB PowerShare port (disabled by default). · **Enable USB PowerShare**
Audio	Allows you to enable or disable the integrated audio controller. By default, the **Enable Audio** option is selected. The options are: · **Enable Microphone** · **Enable Internal Speaker** This option is set by default.
Keyboard Illumination	This option lets you choose the operating mode of the keyboard illumination feature The options are: · **Disabled** · **25%** · **50%** · **75%** · **100%**
Keyboard Backlight Timeout on AC	Allows to define the timeout value for the keyboard backlight when an AC adapter is plugged in the system. The Keyboard Backlight tiemout value is only in effect when the backlight is enabled. · **5 seconds** · **10 seconds**—Default · **15 seconds** · **30 seconds** · **1 minute** · **5 minutes** · **15 minutes** · **Never**
Keyboard Backlight Timeout on Battery	Allows to define the timeout value for the keyboard backlight when the system is running only on battery power. The Keyboard

Option	Description
	Backlight tiemout value is only in effect when the backlight is enabled. · **5 seconds** · **10 seconds**—Default · **15 seconds** · **30 seconds** · **1 minute** · **5 minutes** · **15 minutes** · **Never**
RGB Keyboard Backlight	This option allows to enable / select backlight color or configure RGB intensity values to activate two custom backlight colors. The options are: · **White** · **Red** · **Green** · **Blue** · **Custom1** · **Custom2**
Touchscreen	This option controls whether the touchscreen is enabled or disabled
Stealth mode Control	This option allows configuration of Dell Stealth mode feature. **Configurable control features:** · **Onboard LEDs** · **LCD screen** · **Speakers** · **Fans** · **Radio** · **GPS receiver** · **WLAN radio** · **WWAN radio.**
Miscellaneous devices	Allows you to enable or disable various on board devices. · **Enable PC Card** · **Enable Camera**—Default · **Enable Hard Drive Free Fall Protection** · **Enable Dedicated GPS Radio** · **Enable Secure Digital (SD) Card** · **Secure Digital (SD) Card Boot** - Disabled · **Secure Digital Card (SD) Read-Only Mode** - Disabled · **Enable Rugged Dock NIC PXE Support** - Disabled

Video screen options

Table 58. Video

Option	Description
LCD Brightness	Allows you to set the display brightness depending upon the power source. On Battery(50% is default) and On AC (100 % default).

Security

Table 59. Security

Option	Description
Admin Password	Allows you to set, change, or delete the administrator(admin) password. The entries to set password are: · **Enter the old password:** · **Enter the new password:** · **Confirm new password:** Click **OK** once you set the password. **NOTE: For the first time login, "Enter the old password:" field is marked to "Not set". Hence, password has to be set for the first time you login and then you can change or delete the password.**
System Password	Allows you to set, change, or delete the System password. The entries to set password are: · **Enter the old password:** · **Enter the new password:** · **Confirm new password:** Click **OK** once you set the password. **NOTE: For the first time login, "Enter the old password:" field is marked to "Not set". Hence, password has to be set for the first time you login and then you can change or delete the password.**
Strong Password	Allows you to enforce the option to always set strong password. · **Enable Strong Password** This option is not set by default.
Password Configuration	You can define the length of your password. Min = 4, Max = 32
Password Bypass	Allows you to bypass the System password and the Internal HDD password, when it is set, during a system restart. Click one of the options: · **Disabled**—Default

Option	Description
	• **Reboot bypass**
Password Change	Allows you to change the System password when the administrator password is set. • **Allow Non-Admin Password Changes** This option is set by default.
Non-Admin Setup Changes	Allows you to determine whether changes to the setup options are allowed when an Administrator Password is set. If disabled the setup options are locked by the admin password. • **Allow Wireless Switch Changes** This option is not set by default.
UEFI Capsule Firmware Updates	Allows you to update the system BIOS via UEFI capsule update packages. • **Enable UEFI Capsule Firmware Updates** This option is set by default.
TPM 2.0 Security	Allows you to enable or disable the Trusted Platform Module (TPM) during POST. The options are: • **TPM On**—Default • **Clear** • **PPI Bypass for Enable Command**—Default • **PPI Bypass for Disbale Command** • **PPI Bypass for Clear Command** • **Attestation Enable**—Default • **Key Storage Enable**—Default • **SHA-256**—Default
Computrace (R)	Allows you to activate or disable the optional Computrace software. The options are: • **Deactivate** • **Disable** • **Activate**—Default
OROM keyboard Access	Allows you to enable or disable Option ROM configuration screens via hotkeys during boot. • **Enable**—Default • **Disable** • **One Time Enable**
Admin Setup Lockout	Allows you to prevent users from entering Setup when an administrator password is set. • **Enable Admin Setup Lockout** This option is not set by default.
Master Password Lockout	Allows you to disable master password support. • **Enable Master Password Lockout** This option is not set by default.

Option	Description
	NOTE: **Hard Disk password should be cleared before the settings can be changed.**
SMM Security Mitigation	Allows you to enable or disable additional UEFI SMM Security Mitigation protection. · **SMM Security Mitigation** This option is not set by default.

Secure boot

Table 60. Secure Boot

Option	Description
Secure Boot Enable	Allows you to enable or disable the Secure Boot Feature. · **Secure Boot Enable**—Default
Secure Boot Mode	Changes to the Secure Boot operation mode modifies the behaviour of Secure Boot to allow evaluation of UEFI driver signatures. Choose one of the option: · **Deployed Mode**—Default · **Audit Mode**
Expert Key Management	Allows you to enable or disable Expert Key Management. · **Enable Custom Mode** This option is not set by default. The Custom Mode Key Management options are: · **PK**—Default · **KEK** · **db** · **dbx**

Intel Software Guard Extensions options

Table 61. Intel Software Guard Extensions

Option	Description
Intel SGX Enable	This field specifies you to provide a secured environment for running code/storing sensitive information in the context of the main OS. Click one of the following options: · **Disabled** · **Enabled**

Option	Description
	• **Software controlled**—Default
Enclave Memory Size	This option sets **SGX Enclave Reserve Memory Size** Click one of the following options: • **32 MB** • **64 MB** • **128 MB**—Default

Performance

Table 62. Performance

Option	Description
Multi Core Support	This field specifies whether the process has one or all cores enabled. The performance of some applications improves with the additional cores. • **All**—Default • **1** • **2** • **3**
Intel SpeedStep	Allows you to enable or disable the Intel SpeedStep mode of processor. • **Enable Intel SpeedStep** This option is set by default.
C-States Control	Allows you to enable or disable the additional processor sleep states. • **C states** This option is set by default.
Intel TurboBoost	Allows you to enable or disable the Intel TurboBoost mode of the processor. • **Enable Intel TurboBoost** This option is set by default.
Hyper-Thread Control	Allows you to enable or disable the HyperThreading in the processor. • **Disabled** • **Enabled**—Default

Power management

Table 63. Power Management

Option	Description
Lid Switch	Allows you to enable or disable the lid switch from automatically turning on / off the screen when the lid is closed.
AC Behavior	Allows you to enable or disable the computer from turning on automatically when an AC adapter is connected. • **Wake on AC** This option is not set by default.
Auto On Time	Allows you to set the time at which the computer must turn on automatically. The options are: • **Disabled**—Default • **Every Day** • **Weekdays** • **Select Days** This option is not set by default.
USB Wake Support	Allows you to enable USB devices to wake the system from standby. • **Enable USB Wake Support** • **Wake on Dell USB-C Dock** This option is not set by default.
Wireless Radio Control	This option if enabled, will sense the connection of the system to a wired network and subsequently disable the selected wireless radios (WLAN and/or WWAN). Upon disconnection from the wired network the selected wireless radio will ne enabled. • **Control WLAN radio** • **Control WWAN radio** This option is not set by default.
Wake on LAN	This option allows the computer to power up from the off state when triggered by a special LAN signal. Wake-up from the Standby state is unaffected by this setting and must be enabled in the operating system. This feature only works when the computer is connected to AC power supply. • **Disabled**—Default - Does not allow the system to power on by special LAN signals when it receives a wake-up signal from the LAN or wireless LAN. • **LAN Only** - Allows the system to be powered on by special LAN signals. • **WLAN Only** - Allows the system to be powered on by special WLAN signals. • **LAN or WLAN** - Allows the system to be powered on by special LAN or WLAN signals.
Peak Shift	Allows you enable of disable the Peak shift feature. This feature when enabled minimizes the AC power usage at times of peak demand. Battery doesnot charge between the Peak Shift start and end time Peak Shift Start and End Time can be configured for all weekdays This option set the battery threshold value (15 % to 100 %)

Option	Description
Advanced Battery Charge Configuration	This option enables you to maximize the battery health. By enabling this option, your system uses the standard charging algorithm and other techniques, during the non-work hours to improve the battery health. Advanced Battery Charge Mode can be configured for all weekdays
Battery #1 Charge Configuration **Battery #2 Charge Configuration**	Allows you to select the charging mode for the battery. The options are: • **Adaptive**—Default • **Standard** - Fully charges your battery at a standard rate. • **ExpressCharge**- The battery charges over a shorter period of time using Dell's fast charging technology. • **Primarily AC use** • **Custom** If Custom Charge is selected, you can also configure Custom Charge Start and Custom Charge Stop. **NOTE: All charging mode may not be available for all the batteries.**
Type-C connector Power	This option allows you to set maximum power that can be drawn from the Type-C connector. The options are: • **7.5 Watts**—Default • **15 Watts**
Power Usage Mode	This field lets you choose the system power usage mode. The options are: • **Power Saver** • **Balanced** — Default. • **High Performance**

Post behavior

Table 64. POST Behavior

Option	Description
Adapter Warnings	Allows you to enable or disable the system setup (BIOS) warning messages when you use certain power adapters. • **Enable Adapter Warnings**—Default
Keypad (Embedded)	Allows you to one of the two methods to enable the keypad that is embedded in the internal keyboard. • **Fn Key Only** : The keypad is only enabled when you hold down the Fn key (Default) • **By Num Lock** : The keypad is enabled only when the NumLock LED is on.
Numlock Enable	Allows you to enable or disable the Numlock function when the system boots. • **Enable Numlock**—Default

Option	Description
Fn Lock Options	Allows you to let hot key combinations Fn + Esc toggle the primary behavior of F1–F12, between their standard and secondary functions. If you disable this option, you cannot toggle dynamically the primary behavior of these keys. • **Fn Lock**—Default Click one of the following options: • **Lock Mode Disable/Standard** • **Lock Mode Enable/Secondary**—Default
Fastboot	Allows you to speed up the boot process by bypassing some of the compatibility steps. Click one of the following options: • **Minimal**—Default • **Thorough** • **Auto**
Extended BIOS POST Time	Allows you to create an additional preboot delay. Click one of the following options: • **0 seconds**—Default • **5 seconds** • **10 seconds**
Full Screen Logo	Allows you to display full screen logo, if your image matches screen resolution. • **Enable Full Screen Logo** This option is not set by default.
Warnings and Errors	Allows you to select different options to either stop, prompt and wait for user input, continue when warnings are detected but pause on errors, or continue when either warnings or errors are detected during the POST process. Click one of the following options: • **Prompt on Warnings and Errors**—Default • **Continue on Warnings** • **Continue on Warnings and Errors**
MAC Address Pass-Through	This feature replaces the external NIC MAC address (in a supported dock or dongle) with selected MAC address from the system. Click one of the following options: • **Passthrough MAC Address**—Default • **Integrated NIC 1 MAC Address** • **Disabled**

Manageability

Table 65. Manageability

Option	Description
USB Provision	This option lets you to provision Intel AMT using provisioning file stored on local USB storage
MEBx Hotkey	This option allows you to enable or disable hotkey (Ctrl +P) functionality at Dell logo to enter Management Engine BIOS Extension (MEBx)

Virtualization support

Table 66. Virtualization Support

Option	Description
Virtualization	This option specifies whether a Virtual Machine Monitor (VMM) can utilize the additional hardware capabilities provided by the Intel Virtualization technology. · **Enable Intel Virtualization Technology** This option is set by default.
VT for Direct I/O	Enables or disables the Virtual Machine Monitor (VMM) from utilizing the additional hardware capabilities provided by the Intel Virtualization technology for direct I/O. · **Enable VT for Direct I/O** This option is set by default.
Trusted Execution	This option allows Measured Virtual Machine Monitor (MVMM) to use additional hardware capabilities provisioned by Intel Trusted Execution Technology · **Enable Trusted Execution** **NOTE: The Intel Virtualization Technology, VT for direct I/O and TPM has to be enabled and activated for this feature to work.**

Wireless options

Table 67. Wireless

Option	Description
Wireless Switch	Allows to set the wireless devices that can be controlled by the wireless switch. The options are: · **WWAN** · **GPS (on WWAN Module)** · **WLAN**

Option	Description
	• **Bluetooth** All the options are enabled by default.
Wireless Device Enable	Allows you to enable or disable the internal wireless devices. The options are: • **WWAN/GPS** • **WLAN** • **Bluetooth** All the options are enabled by default.

Maintenance

Table 68. Maintenance

Option	Description
Service Tag	Displays the service tag of your computer.
Asset Tag	Allows you to create a system asset tag if an asset tag is not already set. This option is not set by default.
BIOS Downgrade	Allows you to flash previous revisions of the system firmware. • **Allow BIOS Downgrade** This option is set by default.
Data Wipe	Allows you to securely erase data from all internal storage devices. • **Wipe on Next Boot** This option is not set by default.
Bios Recovery	**BIOS Recovery from Hard Drive**—This option is set by default. Allows you to recover the corrupted BIOS from a recovery file on the HDD or an external USB key. **BIOS Auto-Recovery**— Allows you to recover the BIOS automatically. **NOTE: BIOS Recovery from Hard Drive field should be enabled.** **Always Perform Integrity Check**—Performs integrity check on every boot.

System logs

Table 69. System Logs

Option	Description
BIOS events	Allows you to view and clear the System Setup (BIOS) POST events.
Thermal Events	Allows you to view and clear the System Setup (Thermal) events.
Power Events	Allows you to view and clear the System Setup (Power) events.

Boot Sequence

Boot Sequence allows you to bypass the System Setup–defined boot device order and boot directly to a specific device (for example: optical drive or hard drive). During the Power-on Self Test (POST), when the Dell logo appears, you can:

- Access System Setup by pressing F2 key
- Bring up the one-time boot menu by pressing F12 key

The one-time boot menu displays the devices that you can boot from including the diagnostic option. The boot menu options are:

- Removable Drive (if available)
- STXXXX Drive

  NOTE: XXX denotes the SATA drive number.
- Optical Drive (if available)
- SATA Hard Drive (if available)
- Diagnostics

  NOTE: Choosing Diagnostics, will display the ePSA diagnostics screen.

The boot sequence screen also displays the option to access the System Setup screen.

Updating the BIOS in Windows

It is recommended to update your BIOS (System Setup), when you replace the system board or if an update is available. For laptops, ensure that your computer battery is fully charged and connected to a power outlet.

NOTE: If BitLocker is enabled, it must be suspended prior to updating the system BIOS, and then re-enabled after the BIOS update is completed.

1. Restart the computer.
2. Go to **Dell.com/support**.
   - Enter the **Service Tag** or **Express Service Code** and click **Submit**.
   - Click **Detect Product** and follow the instructions on screen.
3. If you are unable to detect or find the Service Tag, click **Choose from all products**.
4. Choose the **Products** category from the list.

   NOTE: Choose the appropriate category to reach the product page
5. Select your computer model and the **Product Support** page of your computer appears.
6. Click **Get drivers** and click **Drivers and Downloads**.
   The Drivers and Downloads section opens.
7. Click **Find it myself**.

8 Click **BIOS** to view the BIOS versions.

9 Identify the latest BIOS file and click **Download**.

10 Select your preferred download method in the **Please select your download method below** window, click **Download File**.
The **File Download** window appears.

11 Click **Save** to save the file on your computer.

12 Click **Run** to install the updated BIOS settings on your computer.
Follow the instructions on the screen.

Updating BIOS on systems with BitLocker enabled

CAUTION: If BitLocker is not suspended before updating the BIOS, the next time you reboot the system it will not recognize the BitLocker key. You will then be prompted to enter the recovery key to progress and the system will ask for this on each reboot. If the recovery key is not known this can result in data loss or an unnecessary operating system re-install. For more information on this subject, see Knowledge Article: http://www.dell.com/support/article/sln153694

Updating your system BIOS using a USB flash drive

If the system cannot load into Windows but there is still a need to update the BIOS, download the BIOS file using another system and save it to a bootable USB Flash Drive.

NOTE: You will need to use a bootable USB Flash drive. Please refer to the following article for further details: http://www.dell.com/support/article/sln143196

1 Download the BIOS update .EXE file to another system.

2 Copy the file e.g. O9010A12.EXE onto the bootable USB Flash drive.

3 Insert the USB Flash drive into the system that requires the BIOS update.

4 Restart the system and press F12 when the Dell Splash logo appears to display the One Time Boot Menu.

5 Using arrow keys, select **USB Storage Device** and click Return.

6 The system will boot to a Diag C:\> prompt.

7 Run the file by typing the full filename e.g. O9010A12.exe and press Return.

8 The BIOS Update Utility will load, follow the instructions on screen.

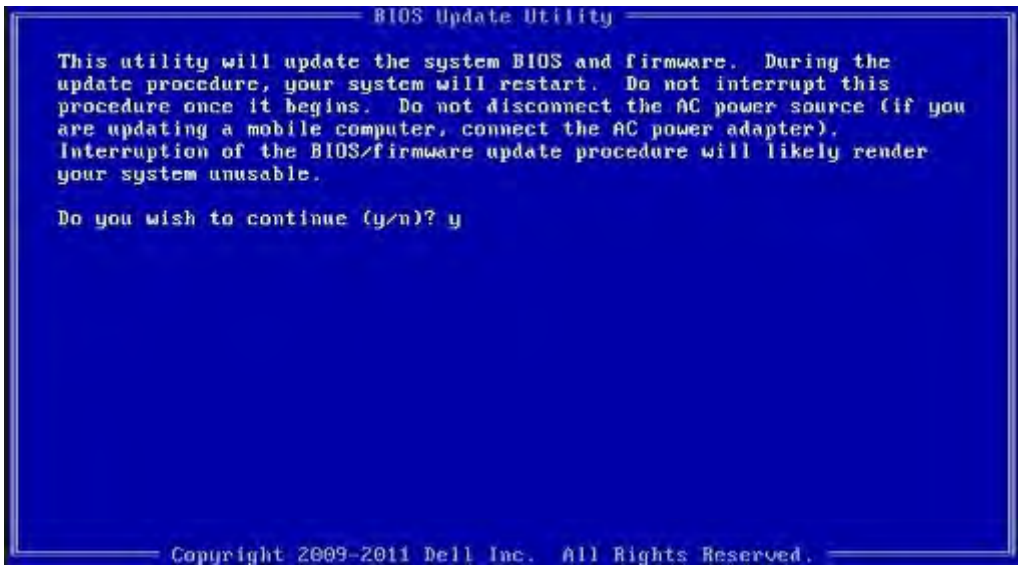


Figure 15. DOS BIOS Update Screen

Updating the Dell BIOS in Linux and Ubuntu environments

If you want to update the system BIOS in a Linux environment such as Ubuntu, see http://www.dell.com/support/article/sln171755.

System and setup password

Table 70. System and setup password

Password type	Description
System password	Password that you must enter to log on to your system.
Setup password	Password that you must enter to access and make changes to the BIOS settings of your computer.

You can create a system password and a setup password to secure your computer.

CAUTION: The password features provide a basic level of security for the data on your computer.

CAUTION: Anyone can access the data stored on your computer if it is not locked and left unattended.

NOTE: System and setup password feature is disabled.

Assigning a system setup password

You can assign a new **System or Admin Password** only when the status is in **Not Set**.

To enter the system setup, press F2 immediately after a power-on or re-boot.

1. In the **System BIOS** or **System Setup** screen, select **Security** and press Enter.
   The **Security** screen is displayed.
2. Select **System/Admin Password** and create a password in the **Enter the new password** field.
   Use the following guidelines to assign the system password:
   - A password can have up to 32 characters.
   - The password can contain the numbers 0 through 9.
   - Only lower case letters are valid, upper case letters are not allowed.
   - Only the following special characters are allowed: space, (”), (+), (,), (-), (.), (/), (;), ([), (\), (]), (`).
3. Type the system password that you entered earlier in the **Confirm new password** field and click **OK**.
4. Press Esc and a message prompts you to save the changes.
5. Press Y to save the changes.
   The computer reboots.

Deleting or changing an existing system setup password

Ensure that the **Password Status** is Unlocked (in the System Setup) before attempting to delete or change the existing System and/or Setup password. You cannot delete or change an existing System or Setup password, if the **Password Status** is Locked.
To enter the System Setup, press F2 immediately after a power-on or reboot.

1. In the **System BIOS** or **System Setup** screen, select **System Security** and press Enter.

The **System Security** screen is displayed.

2 In the **System Security** screen, verify that **Password Status** is **Unlocked**.

3 Select **System Password**, alter or delete the existing system password and press Enter or Tab.

4 Select **Setup Password**, alter or delete the existing setup password and press Enter or Tab.

NOTE: If you change the System and/or Setup password, re-enter the new password when promoted. If you delete the System and/or Setup password, confirm the deletion when promoted.

5 Press Esc and a message prompts you to save the changes.

6 Press Y to save the changes and exit from System Setup.

The computer reboot.

7

Diagnostics

This chapter details the built in troubleshooting features to diagnose the Dell systems. It also lists the invoking instructions along with related information for each diagnostics method.

Topics:

ePSA Diagnostics

The ePSA diagnostics (also known as system diagnostics) performs a complete check of your hardware. The ePSA is embedded with the BIOS and is launched by the BIOS internally. The embedded system diagnostics provides a set of options for particular devices or device groups allowing you to:

- Run tests automatically or in an interactive mode
- Repeat tests
- Display or save test results
- Run thorough tests to introduce additional test options to provide extra information about the failed device(s)
- View status messages that inform you if tests are completed successfully
- View error messages that inform you of problems encountered during testing

NOTE: The Enhanced Pre-boot System Assessment window displays, listing all devices detected in the computer. The diagnostics starts running the tests on all the detected devices.

Running ePSA diagnostics

Invoke diagnostics by either of the methods that are suggested below:

- **Tap F12** key on keyboard, as the Dell splash screen appears, until you get message **Diagnostic Boot Selected.**
  - On the one time boot menu screen, use Up/Down arrow key to select the **Diagnostics** option and then press **<Return>**.
- Press and Hold **Function(Fn)** key on the keyboard and Press the **Power button** to power on the system.

ePSA User Interface

This section contains information on ePSA 3.0's Basic and Advanced Screen.

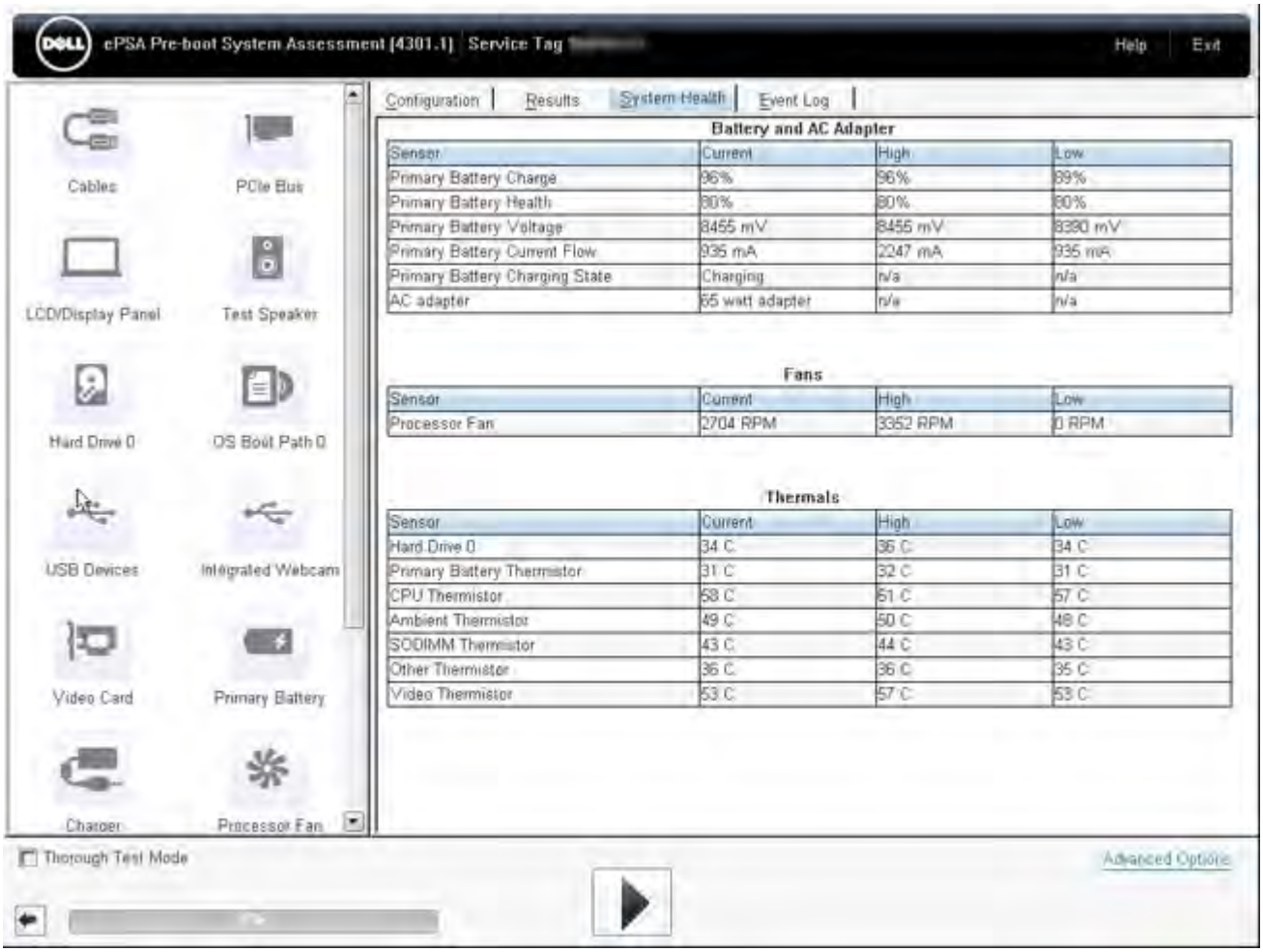
ePSA opens basic screen on start. You can switch to advanced screen using the arrow icon on the bottom. Advanced screen shows detected devices on the left column. Specific test can be included or excluded only in the interactive mode.

ePSA Basic Screen

The Basic Screen has minimal controls which allows easy navigation for user to start or stop the diagnostic.

ePSA Advanced Screen

The advanced screen allows more directed testing and contains more detail information about the overall health of the system. The user can get to this screen by simply swiping your finger to the left on touchscreen systems or clicking the next page button on the lower right hand side of the basic screen.



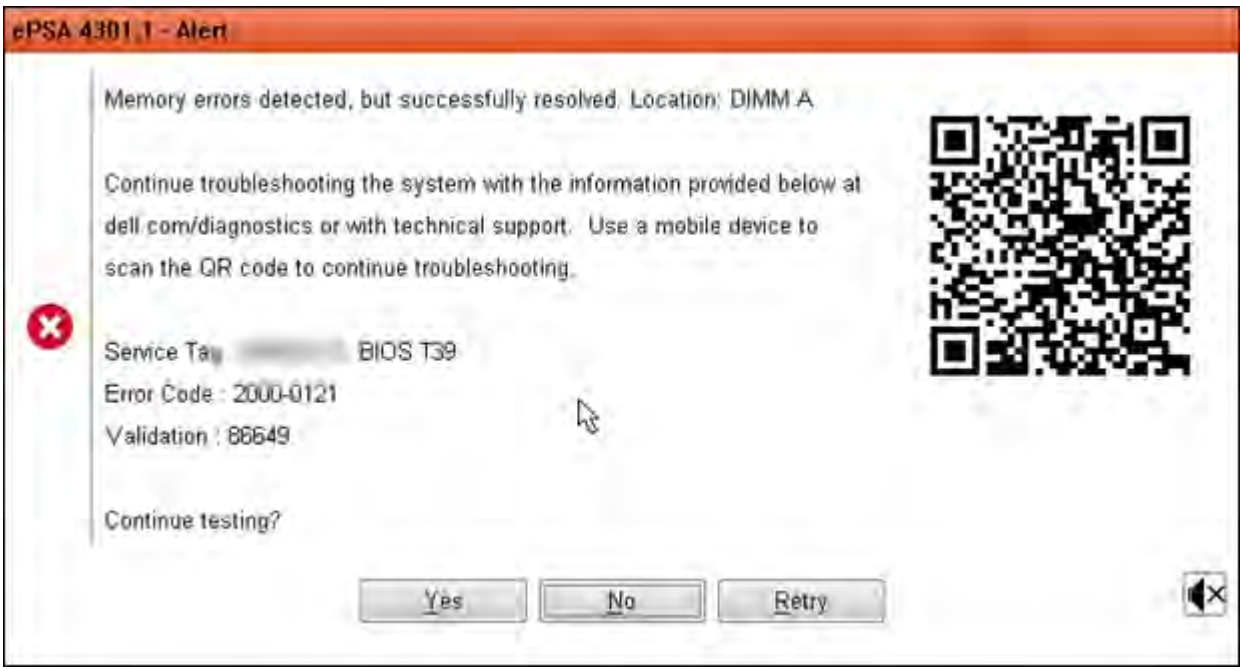
To run test on specific device or run a specific test

1 To run a diagnostic test on a specific device, press Esc and click **Yes** to stop the diagnostic test.

2 Select the device from the left pane and click **Run Tests** or use **Advanced Option** to include or exclude any Test.

ePSA Error Messages

When the Dell ePSA Diagnostic detects an error while running, it will pause the test and then popup a window as shown below :



- By responding to **Yes**, the diagnostic will continue testing the next device and the error details will be available in the summary report.
- By responding to **No**, the diagnostic will stop testing the remaining untested device.
- By responding to **Retry**, the diagnostic will ignore the error and rerun the last test.

Capture the error code with Validation code or Scan QR code and Contact Dell

NOTE: As part of the new feature, user can now mute the beeping sound code when there is an error , by pressing on at the bottom right side of the error window.

NOTE: Some tests for specific devices require user interaction. Always ensure that you are present at the computer terminal when the diagnostic tests are performed.

Validation Tools

This section contains information on how to validate the ePSA error code.

Error code verification can be done using below two methods :

- Online Enhanced Preboot System Assessment Validation Tool.
- QR scanning using QR APP on Smart Phone.

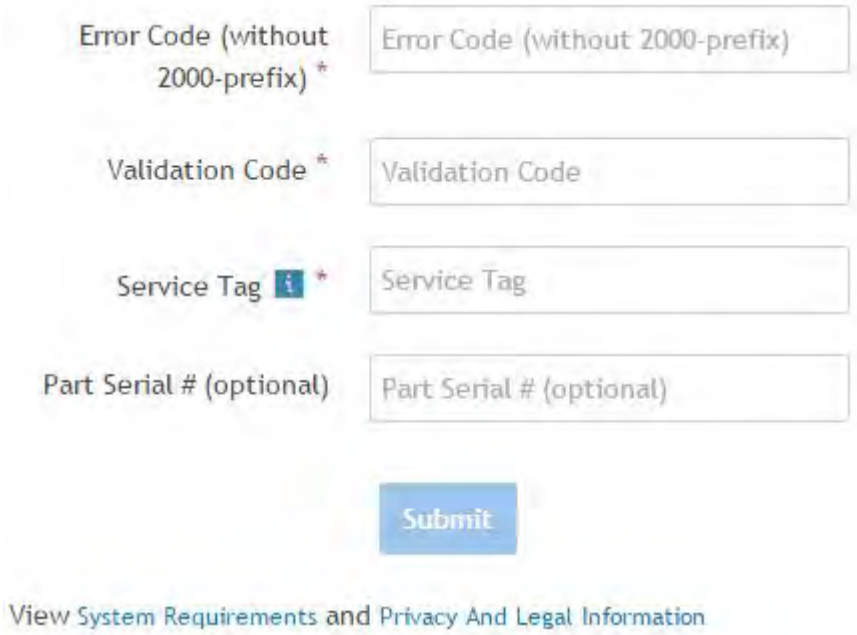
Online ePSA Validation Tool

Usage Guide

1 User to obtain information from ePSA error windows.

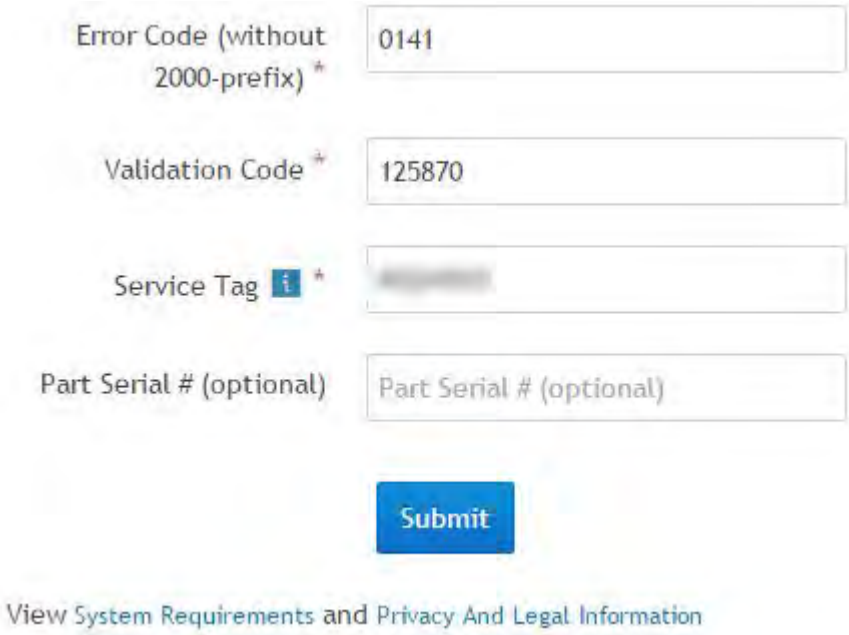
2 Navigate to Online ePSA Validation Tool.

3 Enter error code, validation code, and service tag. Part serial number is optional.

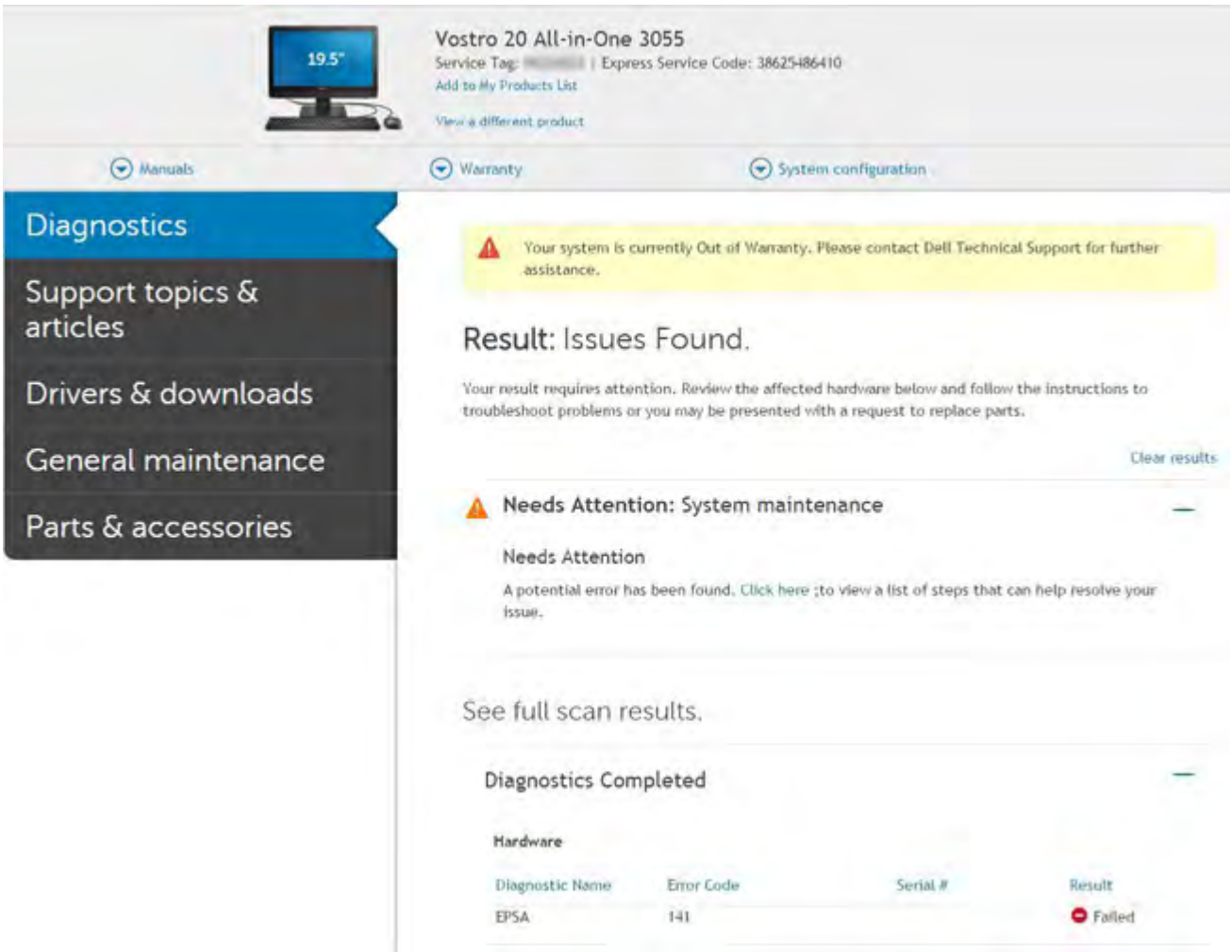


NOTE: For error code, use only the last 3 or 4 digits of the code. (user can enter 0142 or 142 instead of 2000–0142.)

4 Click on **Submit** once all the necessary information is entered.



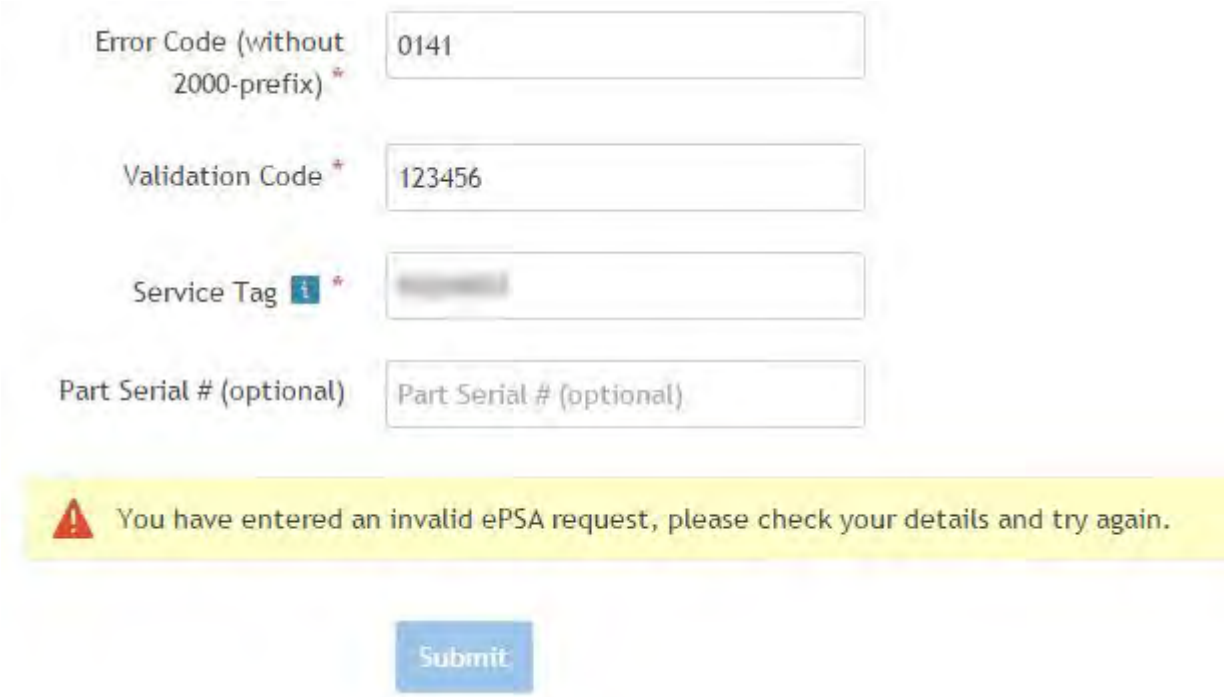
Valid Error Code Example



After entering the correct information, the online tools will direct user to above screen which contains information of :

- Confirmation of the error code and result outcome.
- Suggested Part Replacement.
- If customer is still covered under Dell Warranty.
- Case reference number if there is an open case under the service tag .

Invalid Error Code Example



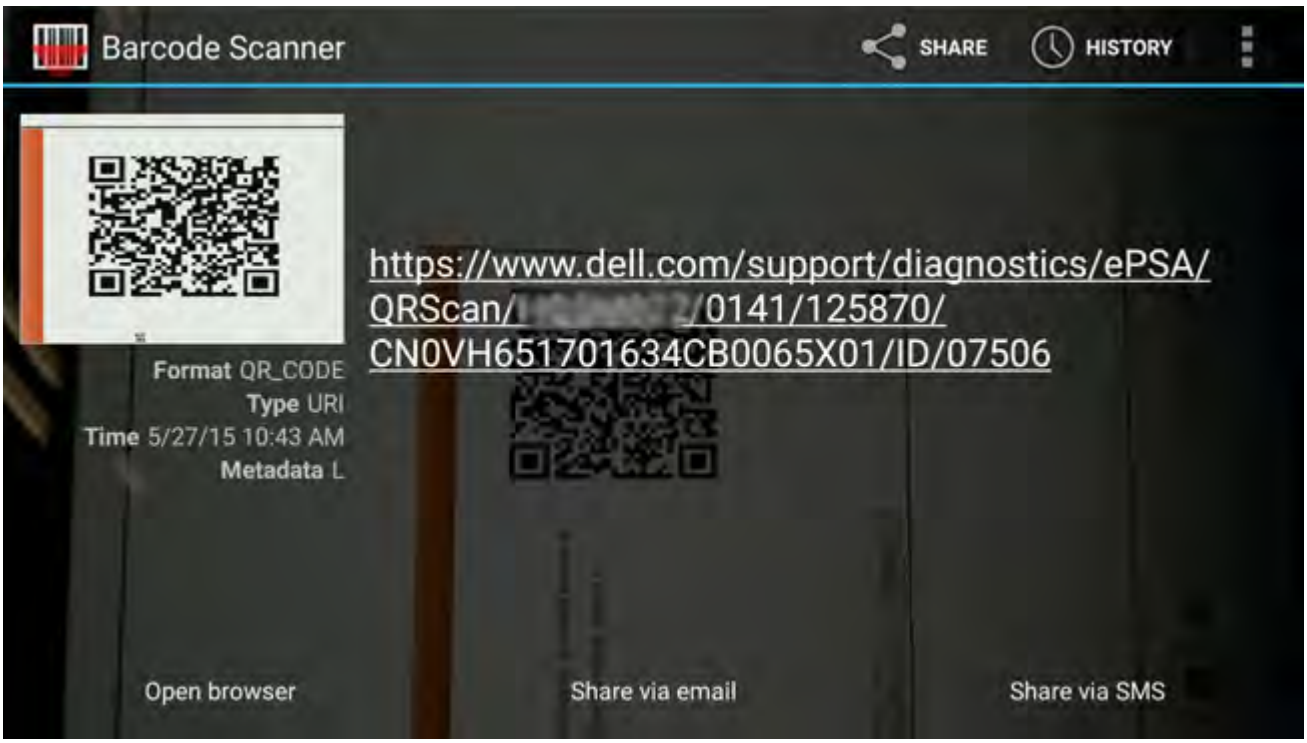
QR APP Validation Tool

Besides using the online tool, customer can also validate the error code by scanning the QR code with a QR APP on smart phone.

1 User to obtain the QR code from ePSA error Windows.

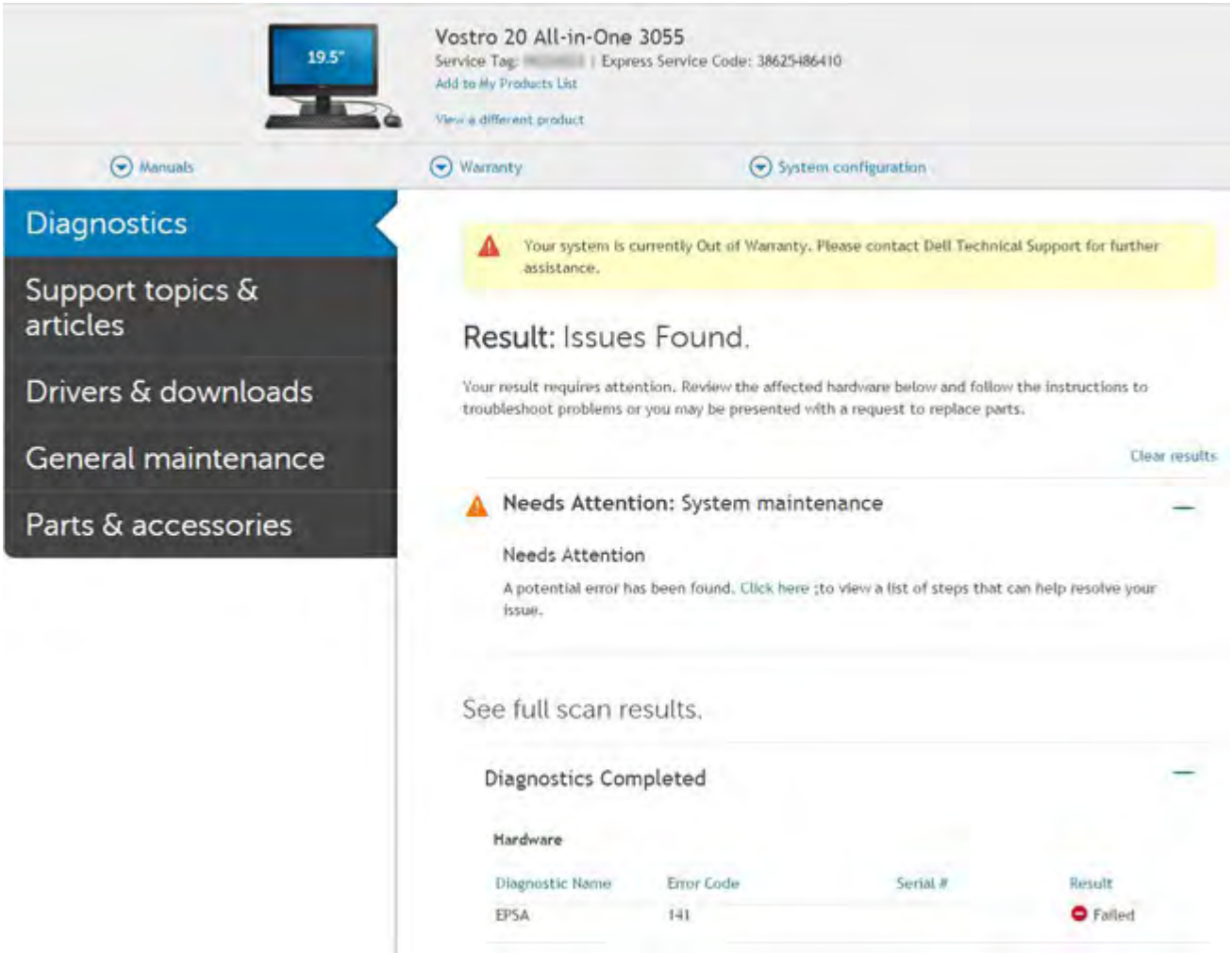
2 User can use any QR code scanner application via smart phone to scan the QR code.

3 QR code scanner application will scan the code and automatically generate the link out. Click on the link to proceed.



The link generated will navigate customer to Dell Support website which contains information of :

- Confirmation of the error code and result outcome.
- Suggested Part Replacement.
- If customer is still covered under Dell Warranty.
- Case reference number if there is an open case under the service tag.



LCD Built-in Self Test

Overview : LCD Built-in Self Test (BIST)

Dell laptop PCs have a built-in diagnostic tool that helps you determine if the screen abnormality you are experiencing is an inherent problem with the LCD (screen) of the Dell laptop PC or with the video card (GPU) and PC settings .

When you notice screen abnormalities like flickering, distortion, clarity issues, fuzzy or blurry image, horizontal or vertical lines, color fade etc., it is always a good practice to isolate the LCD (screen) by running the built-in self test (BIST).

How to invoke LCD BIST Test

1 Power off the Dell laptop PC.
2 Disconnect any peripherals connected to the PC. Connect only the AC adapter (charger) to the PC.
3 Make sure that the LCD (screen) is clean (no dust particles on the surface of the screen).
4 Press and hold **D** key and **Power on** the PC to enter LCD built-in self test (BIST) mode. Continue to hold the D key, until you see color bars on the LCD (screen).
5 The screen will display multiple color bars and change colors on the entire screen to red, green and blue.
6 Carefully inspect the screen for abnormalities.
7 Press Esc key to exit.

NOTE: Dell ePSA upon launch, initiates a LCD BIST first, expecting an user intervention confirm functionality of the LCD.

Battery Status Lights

If the computer is connected to an electrical outlet, the battery light operates as follows:

Alternately blinking amber light and green light	An unauthenticated or unsupported non-Dell AC adapter is attached to your laptop.
Alternately blinking amber light with steady green light	Temporary battery failure with AC adapter present.
Constantly blinking amber light	Fatal battery failure with AC adapter present.
Light off	Battery in full charge mode with AC adapter present.
green light on	Battery in charge mode with AC adapter present.

Diagnostic LED

This section details the diagnostic features of the battery LED in a notebook.

Instead of beep codes errors are indicated via the bicolor Battery Charge LED. A specific blink pattern is followed by flashing a pattern of flashes in green, followed by white. The pattern then repeats.

NOTE: The diagnostic pattern will consist of a two digit number being represented by a first group of LED blinks (1 through 9) in green, followed by a 1.5 second pause with the LED off, and then a second group of LED blinks (1 through 9) in white. This is then followed by a 3 second pause, with the LED off, before repeating over again. Each LED blink takes 0.5 seconds.

The system will not shutdown when displaying the Diagnostic Error Codes. Diagnostic Error Codes will always supersede any other use of the LED. For instance, on Notebooks, battery codes for Low Battery or Battery Failure situations will not be displayed when Diagnostic Error Codes are being displayed:

Table 71. LED pattern

Blinking pattern		Problem Description	Suggested Resolution
Green	White		
2	1	processor	processor failure
2	2	system board, BIOS ROM	system board, covers BIOS corruption or ROM error
2	3	memory	no memory/no RAM detected
2	4	memory	memory failure/RAM failure
2	5	memory	invalid memory installed
2	6	system board; chipset	system board/ chipset error
2	7	display	display failure
3	1	RTC power failure	coin-cell battery failure
3	2	PCI/Video	PCI/Video card/chip failure
3	3	BIOS recovery 1	recovery image nor found
3	4	BIOS recovery 2	recovery image found but invalid

3	5	Power Rail Failure	EC ran into power sequencing failure
3	6	SBIOS Flash Corruption	Flash corruption detected by SBIOS
3	7	ME Error	Timeout waiting on ME to reply to HECI message

Wi-Fi power cycle

If your computer is unable to access the internet due to Wi-Fi connectivity issues a Wi-Fi power cycle procedure may be performed. The following procedure provides the instructions on how to conduct a Wi-Fi power cycle:

NOTE: Some ISPs (Internet Service Providers) provide a modem/router combo device.

1 Turn off your computer.
2 Turn off the modem.
3 Turn off the wireless router.
4 Wait for 30 seconds.
5 Turn on the wireless router.
6 Turn on the modem.
7 Turn on your computer.

BIOS recovery

BIOS recovery using hard drive

1 Ensure that you have the file type extensions visible in the operating system (OS).
2 Ensure that you have the previous version and the latest version of the BIOS from the Dell support site available to use.

1 Browse to the location of the BIOS update executable (.exe) files.
2 Rename the BIOS executable files to **BIOS_PRE.rcv** for the earlier version of the BIOS and **BIOS_CUR.rcv** for the latest version of the BIOS.

   For example, if the latest version's file name is **PowerEdge_T30_1.0.0.exe**, rename it to **BIOS_CUR.rcv** and if the previous version's file name is **PowerEdge_T30_0.0.9.exe**, rename it to **BIOS_PRE.rcv**

   NOTE:
   a If the hard drive is new, there will be no OS installed.
   b If the hard drive has been partitioned at the Dell factory, there will be a **Recovery Partition** available.
3 Disconnect the hard drive and install the hard drive into another system that has a full operational OS.
4 Start up the system and in the Microsoft Windows OS environment follow these steps to copy the BIOS recovery file to the **Recovery Partition**.
   a Open a Windows Command Prompt window.
   b At the prompt, type **diskpart** to start the **Microsoft DiskPart**.
   c At the prompt, type **list disk** to list out the available hard drives.

      Select the hard drive that was installed in Step 3.
   d At the prompt, type **list partition** to view the available partitions on this hard drive.
   e Select **Partition 1** which is the **Recovery Partition**. The size of the partition will be 39 MB.
   f At the prompt, type **set id=07** to set the partition ID.

      NOTE: The partition will be visible to the OS as Local Disk (E) to read and write data.
   g Create the following folders in **Local Disk (E)**, **E:\EFI\Dell\BIOS\Recovery**.
   h Copy both the BIOS files **BIOS_CUR.rcv** and **BIOS_PRE.rcv** to the recovery folder on **Local Disk (E)**.
   i In the **Command Prompt** window, at the **DISKPART** prompt, type **set id=DE**.

      After the executing this command, the partition **Local Disk (E)** will not be accessible by the OS.

5 Shut the system down and remove the hard drive and install the hard drive into the original system.

6 Start the system up and boot to System Setup, in the **Maintenance** section ensure that **BIOS Recovery from Hard Drive** is enabled in the **BIOS Recovery** section of the setup.

7 Press the power button to shut the system down.

8 Holding the **Ctrl and Esc** keys, press the power button to start the system up. Keep holding the **Ctrl and Esc** keys until the **BIOS Recovery Menu** page is displayed.

Ensure that the **Recover BIOS** radio button is selected and click **Continue** to start the BIOS recovery.

BIOS recovery using USB key

1 Ensure that you have the file type extensions visible in the operating system.

2 Ensure that you have downloaded the latest BIOS from the Dell support site and save it on your system.

1 Browse to the location of the downloaded BIOS update executable (.exe) file.

2 Rename the file to BIOS_IMG.rcv.

For example, if the file name is PowerEdge_T30_0.0.5.exe, rename it to BIOS_IMG.rcv

3 Copy the BIOS_IMG.rcv file to the root directory of the USB key.

4 If not plugged in, plug in the USB key, restart the system, press F2 to enter the System Setup, and then press power button to shut down the system.

5 Start the system.

6 While the system is starting up, press the Ctrl+Esc keys while holding the power button until the **BIOS Recovery Menu** dialog box is displayed.

7 Click **Continue** to start the BIOS recovery process.

NOTE: Ensure that the Recovery BIOS option is selected in the BIOS Recovery Menu dialog box.

Self-Heal

Course Introduction

Self-Heal is an option that helps recover a Dell™ Latitude™ system from a No Post, No Power, No Video situation.

Self-Heal Instruction

1 Remove the primary battery and the AC adapter.

2 Disconnect the CMOS battery.

3 Release the flea power. Press and hold the power button down for 10 seconds or leave the system idle for 45 seconds.

4 Make sure the CMOS and primary battery are not plugged into the system.

5 Plug in the AC adapter. The system will auto power-on when the AC adapter inserted.

6 The system will start with a blank screen for a while and will shut down automatically. Watch for the LED lights (power, Wi-Fi, and HDD). It will turn on.

7 The system will try to restart twice and will boot on the third attempt.

8 Place the CMOS battery and the AC adapter back in the system.

9 If self-heal recovers the failure, update the system with the latest BIOS, and perform EPSA to ensure proper functionality of the system.

NOTE:

- During installation or removal of any hardware, always ensure all data is backed up properly.
- For instructions on how to remove or replace parts, visit the disassembly section.
- Before beginning to work on the computer, follow the safety instructions.

Supported Latitude Models

NOTE:

- Before replacing the system board, perform self-heal as a mandatory step.
- Latitude Self-Heal can be avoided when complete system teardown is required to access the coin-cell battery.
- For the Latitude E7 Series (XX70), BIOS Recovery 2.0 should be performed as the primary step.
- In order to reduce troubleshooting time associated with Self-Heal, there is no mandatory requirement to reassemble the system. Technicians can initiate Self-Heal even with the system board exposed.
- **Do not touch** any of the exposed components or the system board to avoid shorting and static.
- If Self-Heal is unable to recover the failure, proceed with replacing the system board.

NOTE:

Frontline Agent Action: Frontline agents must encourage the customer to perform this step before isolating the issue as a motherboard failure. If the customer is not comfortable performing the Self-Heal procedure, then please document the dispatch being created in 5GL. Advise the onsite engineers to perform the Self-Heal procedure as one of the mandatory initial steps. Advise them that if the Self-Heal procedure is unsuccessful, to continue with the regular troubleshooting before part replacement.

Onsite Engineer Action: The Latitude Self-Heal procedure has to be a mandatory initial step. If the Self-Heal procedure is unsuccessful, continue with the regular troubleshooting before part replacement. Document Self-Heal results in the call closure log (Self-Heal Pass or Fail).

8

Getting help

Contacting Dell

NOTE: If you do not have an active Internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell product catalog.

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical support, or customer service issues:

1 Go to **Dell.com/support.**
2 Select your support category.
3 Verify your country or region in the **Choose a Country/Region** drop-down list at the bottom of the page.
4 Select the appropriate service or support link based on your need.