Latitude 5590

Owners Manual

Regulatory Model: P60F
Regulatory Type: P60F002
April 2022
Rev. A06

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.

Contents

1

Working on your computer

Topics:

Safety precautions

The safety precautions chapter details the primary steps to be taken before performing any disassembly instructions.

Observe the following safety precautions before you perform any installation or break/fix procedures involving disassembly or reassembly:

- Turn off the system and all attached peripherals.
- Disconnect the system and all attached peripherals from AC power.
- Disconnect all network cables, telephone, and telecommunications lines from the system.
- Use an ESD field service kit when working inside any notebook to avoid electrostatic discharge (ESD) damage.
- After removing any system component, carefully place the removed component on an anti-static mat.
- Wear shoes with non-conductive rubber soles to reduce the chance of getting electrocuted.

Standby power

Dell products with standby power must be unplugged before you open the case. 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) and suspended into a sleep mode and has other advanced power management features.

Unplugging, pressing and holding the power button for 20 seconds should discharge residual power in the system board. Remove the battery from notebooks.

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 electrostatic discharge (ESD) kit. When connecting a bonding wire, 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 ensure that you remove all jewelry such as watches, bracelets, or rings prior to bonding yourself and the equipment.

Electrostatic discharge—ESD 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 previous Dell products. For this reason, some previously approved methods of handling parts are no longer applicable.

Two recognized types of ESD damage are catastrophic and intermittent failures.

- **Catastrophic** – Catastrophic failures represent approximately 20 percent of ESD-related failures. 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.

- **Intermittent** – 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 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.

The more difficult type of damage to recognize and troubleshoot is the intermittent (also called latent or "walking wounded") failure.

Perform the following steps 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.
- Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and workbench pads.
- 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, ensure that you discharge static electricity from your body.
- Before transporting a static-sensitive component, place it in an anti-static container or packaging.

ESD field service kit

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

Components of an ESD field service kit

The components of an ESD field service kit are:

- **Anti-Static Mat** – The anti-static mat is dissipative and parts can be placed on it 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 any 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. ESD-sensitive items are safe in your hand, on the ESD mat, in the system, or inside a bag.
- **Wrist Strap and Bonding Wire** – 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 at least once per week.
- **ESD Wrist Strap Tester** – The wires inside of an ESD strap are prone to damage over time. When using an unmonitored kit, it is a 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.
- **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.
- **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.
- **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 recommended that all field service technicians 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 technicians keep sensitive parts separate from all insulator parts while performing service and that they use anti-static bags for transporting sensitive components.

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.

Lifting equipment

Adhere to the following guidelines when lifting heavy weight equipment:

CAUTION: Do not lift greater than 50 pounds. Always obtain additional resources or use a mechanical lifting device.

1. Get a firm balanced footing. Keep your feet apart for a stable base, and point your toes out.
2. Tighten stomach muscles. Abdominal muscles support your spine when you lift, offsetting the force of the load.
3. Lift with your legs, not your back.
4. Keep the load close. The closer it is to your spine, the less force it exerts on your back.
5. 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.
6. Follow the same techniques in reverse to set the load down.

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.

After working inside your computer

After you complete any replacement procedure, ensure that you connect any 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.

2

Removing and installing components

This section provides detailed information on how to remove or install the components from your computer.

Topics:

Recommended tools

The procedures in this document may require the following tools:

- Phillips #0 screwdriver
- Phillips #1 screwdriver
- Plastic scribe-Recommended for field technician

Screw size list

Table 1.

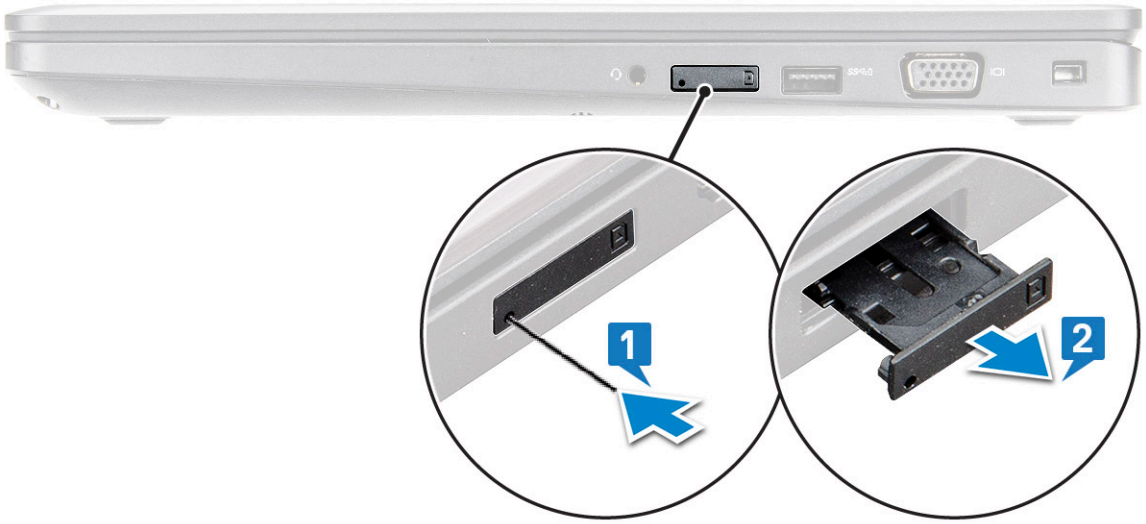
Component	M2.0x3.0	M2.5x3.5	M2.5x5.0	M2.0x2.5	M2x 3.0 (OD 4.5)	M2x5
Base cover			8			
Battery			1			
Soild State Drive	1					
SSD frame	1					
WLAN card	1					
Keyboard				6		
Heat sink	4					
System board	3					
System Fan	2					
Power connector	1					
USB-C port bracket						2
Chassis frame						2
Smart card reader	2					
Touchpad button board	2					
LED board	1					
Hinge cap					2	
Display assembly						6
Hinge		6				
Display panel	4					
Hard drive						4
WWAN	1					

Subscriber Identity Module(SIM) board

Installing the Subscriber Identification Module card

1. Insert Subscriber Identification Module (SIM) card removal tool or a paperclip into the pinhole [1].
2. Pull the SIM card tray to remove it [2].
3. Place the SIM on the SIM card tray.

4. Push the SIM card tray into the slot until it clicks into place.



Removing the Subscriber Identification Module card

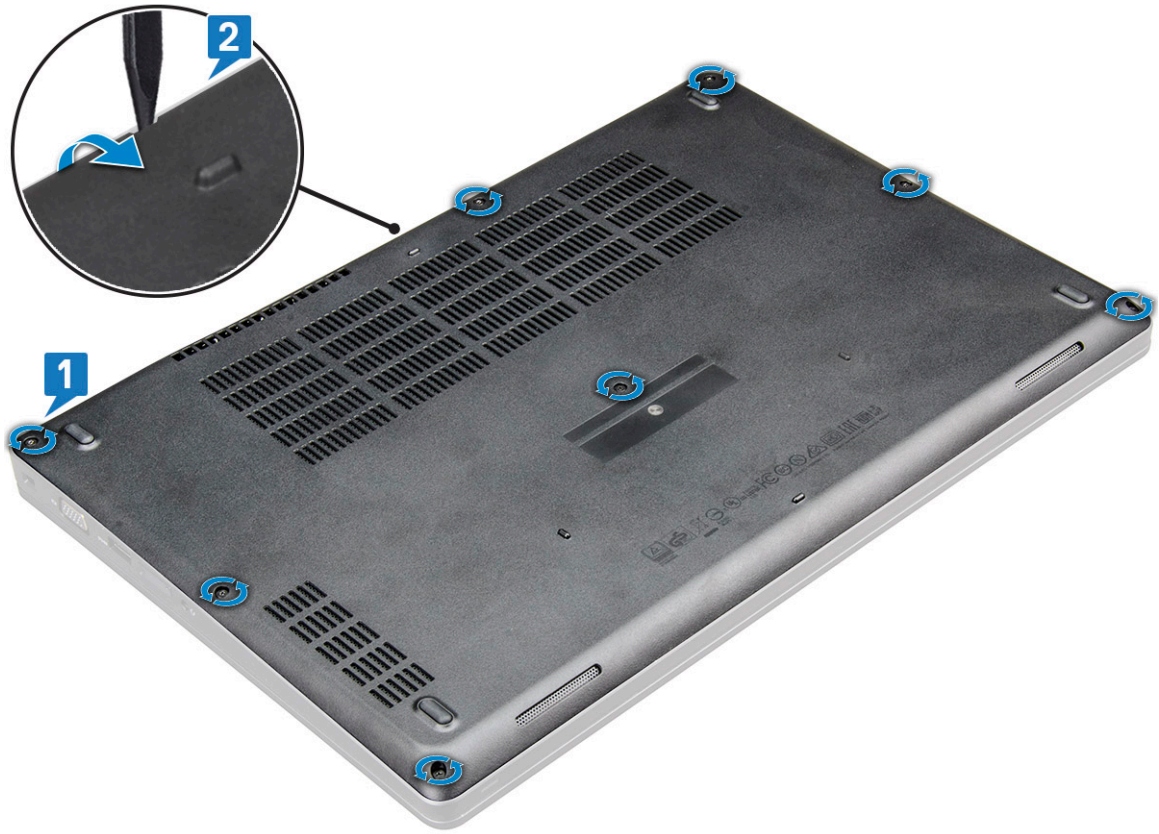
CAUTION: Removing the Subscriber Identification Module (SIM) card when the computer is on may cause data loss or damage the card. Ensure your computer is turned off or the network connections are disabled.

1. Insert a paperclip or a SIM card removal tool into the pinhole on the SIM card tray.
2. Pull the SIM card tray to remove it.
3. Remove the SIM card from the SIM card tray.
4. Push the SIM card tray into the slot until it clicks into place.

Base cover

Removing the base cover

1. Follow the procedure in Before working inside your computer.
2. To remove the base cover:
   a. Loosen the M2.5x5 (8) captive screws that secure the base cover to the laptop [1].
   b. Pry the base cover from the edge near the air vent [2].



3. Lift the base cover away from the laptop.

Installing the base cover

1. Align the base cover with the screw holders on the laptop .

2. Press the edges of the cover until it clicks into place.
3. Tighten the M2x5 screws to secure the base cover to the laptop.
4. Follow the procedure in After working inside your computer.

Battery

Lithium-ion battery precautions

CAUTION:

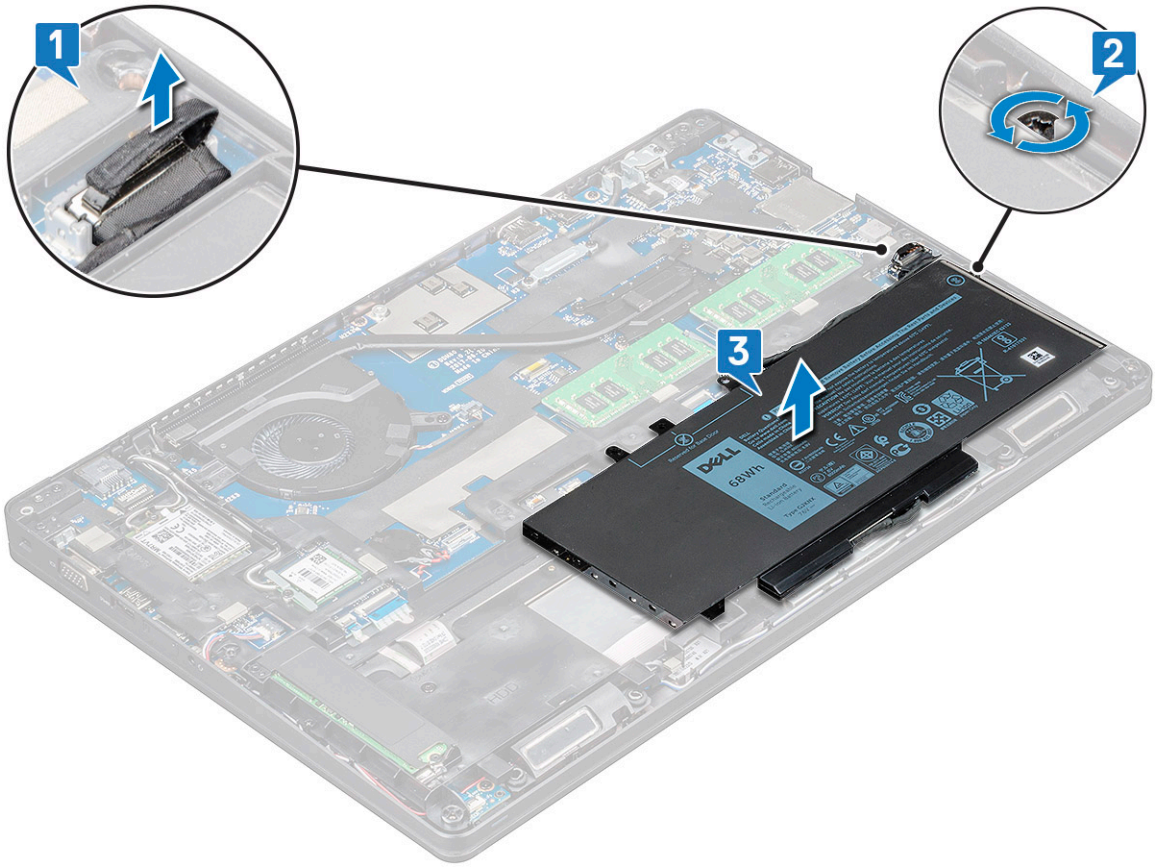
- **Exercise caution when handling Lithium-ion batteries.**
- **Discharge the battery completely before removing it. Disconnect the AC power adapter from the system and operate the computer solely on battery power—the battery is fully discharged when the computer no longer turns on when the power button is pressed.**
- **Do not crush, drop, mutilate, or penetrate the battery with foreign objects.**
- **Do not expose the battery to high temperatures, or disassemble battery packs and cells.**
- **Do not apply pressure to the surface of the battery.**
- **Do not bend the battery.**
- **Do not use tools of any kind to pry on or against the battery.**
- **Ensure any screws during the servicing of this product are not lost or misplaced, to prevent accidental puncture or damage to the battery and other system components.**
- **If the battery gets stuck inside your computer as a result of swelling, do not try to release it as puncturing, bending, or crushing a lithium-ion battery can be dangerous. In such an instance, contact Dell technical support for assistance. See www.dell.com/contactdell.**
- **Always purchase genuine batteries from www.dell.com or authorized Dell partners and resellers.**
- **Swollen batteries should not be used and should be replaced and disposed properly. For guidelines on how to handle and replace swollen Lithium-ion batteries, see Handling swollen Lithium-ion batteries.**

Removing the battery

NOTE: A 4-cell 68Whr battery has only 1 screw.

NOTE: A 3-cell 68Whr battery has only 1 screw

1. Follow the procedure in Before working inside your computer.
2. Remove the base cover.
3. To remove the battery:
   a. Disconnect the battery cable from the connector on the system board [1].
   b. Loosen the M2.5x5 captive screw (1) that secure the battery to the laptop [2].
   c. Lift the battery away from the laptop chassis [3].



Installing the battery

NOTE: 68Whr battery can be used with either a M.2 or 7mm SATA drive.

1. Insert the battery into the slot on the laptop.

   NOTE: Route the battery cable below the battery routing channels to enable proper connection to the connector.

2. Connect the battery cable to the connector on the system board.
3. Tighten the M2.5x5 screw to secure the battery to the laptop.
4. Install the base cover.
5. Follow the procedure in After working inside your computer.

Solid State Drive

Removing the M.2 Solid State Drive - SSD

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the SSD:
   a. Remove the two M2x3 screw [1] that secures the SSD bracket to the laptop and lift the SSD bracket [2] that secures the SSD card to the system board. .

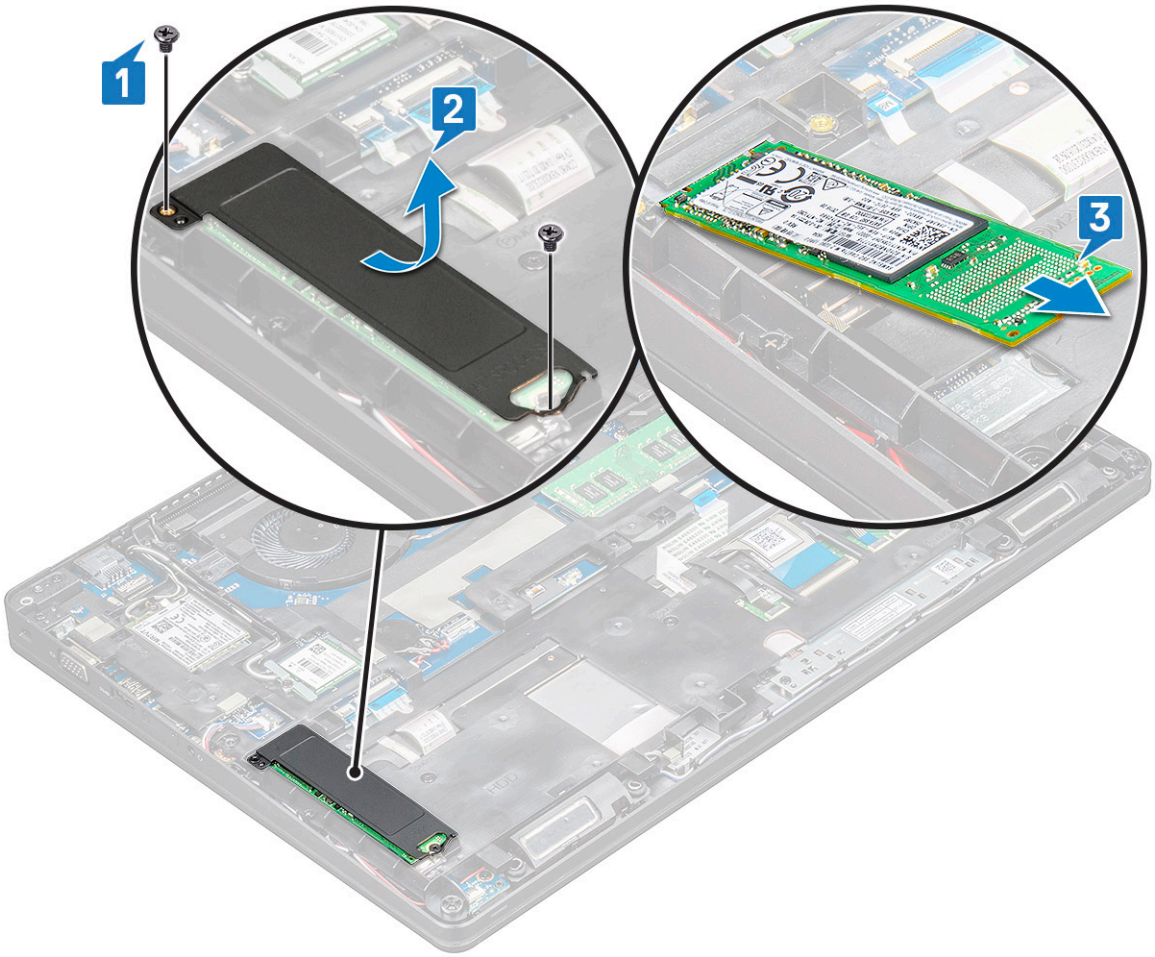
      NOTE: System shipped with NVMe SSDs, the SSD does not require removal of mylar shield.

b. Lift and pull the SSD card from the laptop [3].

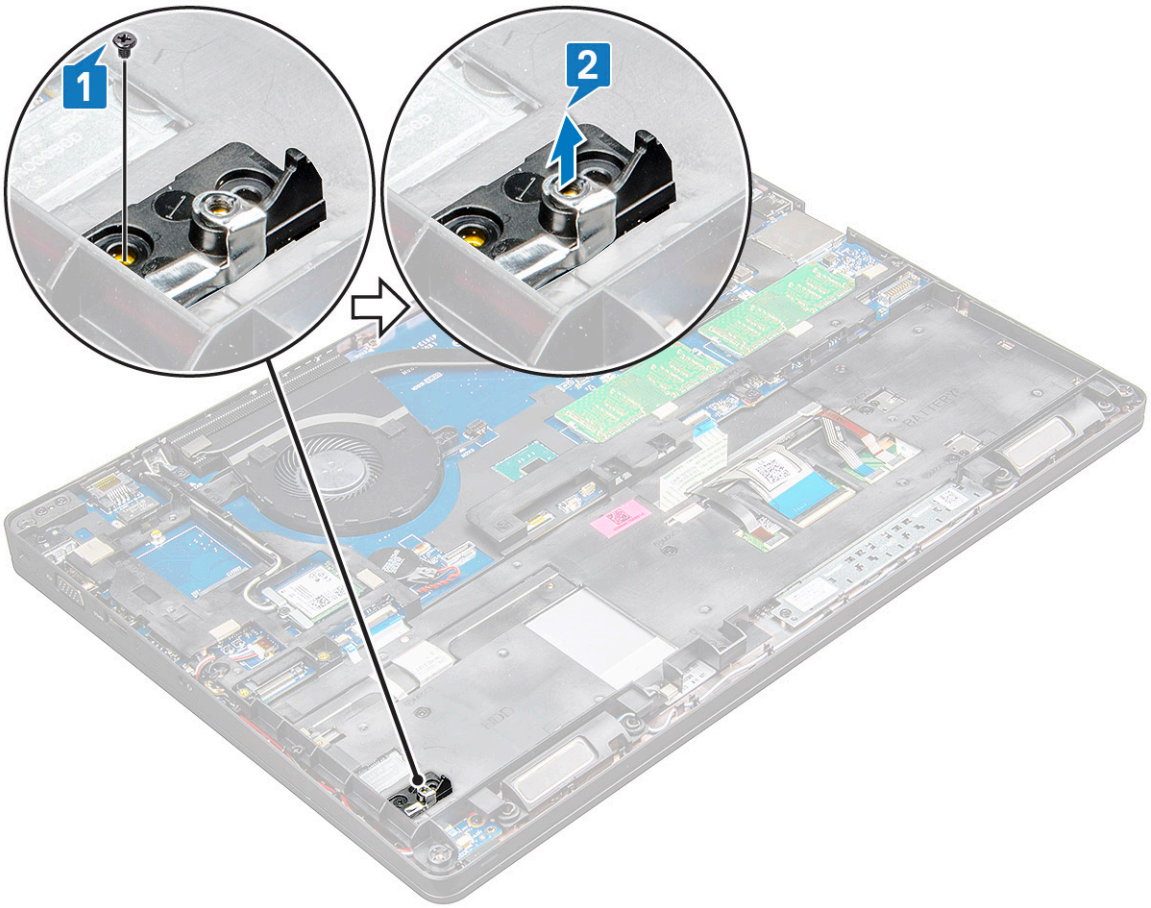
NOTE: For models shipped with NVMe SSDs, remove the thermal plate placed over the SSD.

NOTE: For models shipped with 2230 SSDs, the SSD requires installation of a specific holder over the SSD for securing the SSD in place.

NOTE: SSD frame is installed onto the chassis frame to secure the SSD to the system. The SSD frame is a separate service part that needs to be removed and re-installed whenever the chassis frame is removed.



4. To remove the SSD clip:
   a. Remove the M2x3 screw that secures the SSD frame to the laptop [1].
   b. Lift the SSD frame away from the laptop [2].



Installing the M.2 Solid State Drive - SSD

1. Place the SSD clip on the laptop.

   NOTE: Ensure to place the SSD clip head in the placeholder in the system chassis.

2. Tighten the M2x3 screw that secures SSD clip to the laptop.
3. Insert the SSD into the socket on the laptop.
4. Place the SSD bracket and tighten the M2x3 screw (2) to secure the SSD to the laptop.
5. Install the:
   a. battery
   b. base cover
6. Follow the procedure in After working inside your computer.

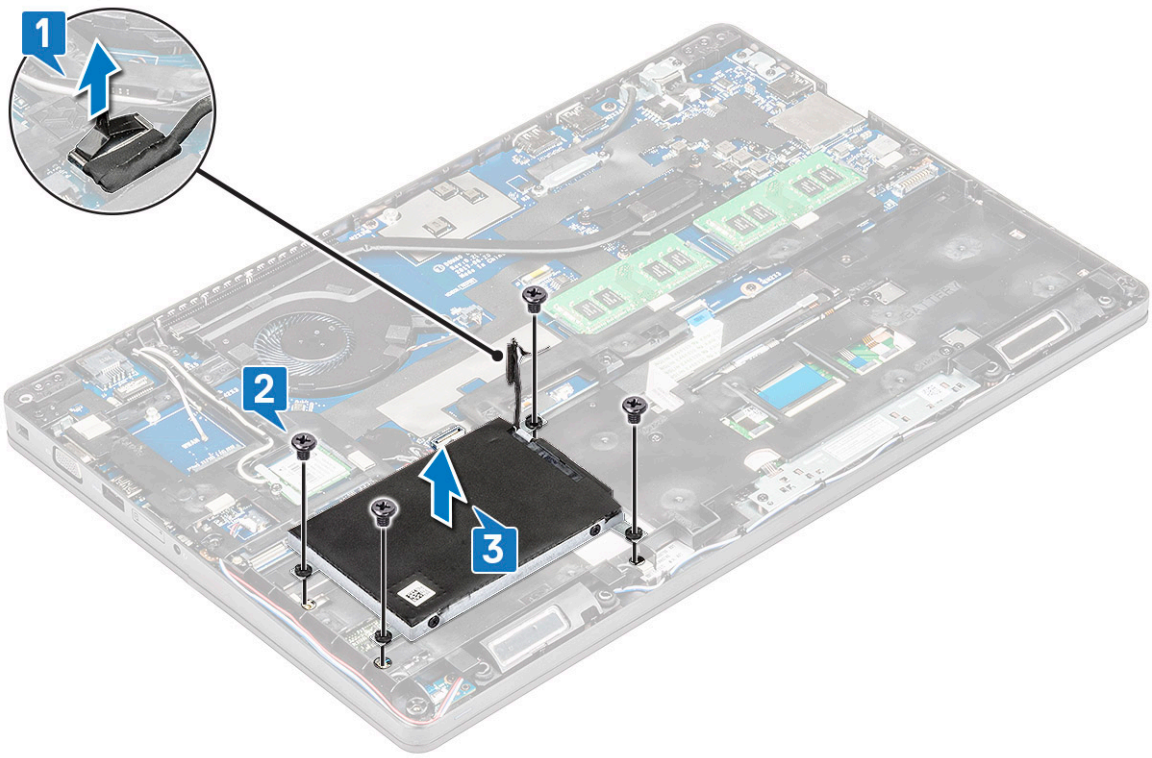
Hard drive

Removing hard drive

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the hard drive:
   a. Disconnect the hard drive cable from the connector on the system board [1].

NOTE: The system default configuration is HDD. The laptop is either shipped with HDD or SDD.

b. Remove the M2x5 screws (4) that secure the hard drive to the system [2].
c. Lift the hard drive away from the system [3].



Installing hard drive

1. Insert the hard drive into the slot on the system.
2. Replace the screws to secure the hard drive to the system.
3. Replace the hard drive cable.
4. Replace the screws to secure the hard drive assembly to the system.
5. Connect the hard drive cable to the connector on the system board.
6. Install the :
   a. base cover
   b. battery
7. Follow the procedures in After working inside your system.

WLAN card

Removing the WLAN card

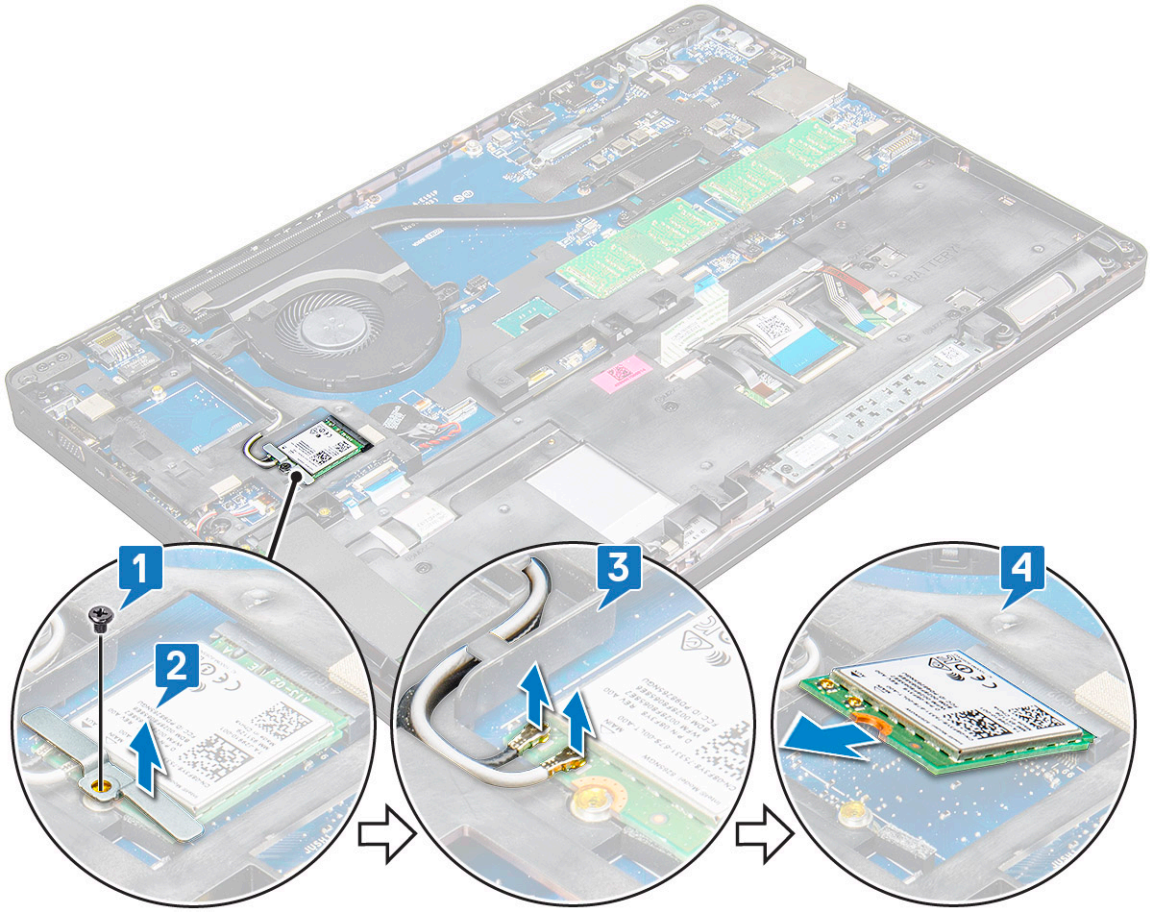
1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the WLAN card:
   a. Remove the M2x3 screw (1) that secures the WLAN card to the laptop [1].
   b. Lift the metal bracket that secures the WLAN cables to the WLAN card [2].

c. Disconnect the WLAN cables from the connectors on the WLAN card [3].

NOTE: The WLAN card is held in place with an adhesive foam spacer. When removing the wireless card from the system, make sure the adhesive pad stays on the system board/chassis frame during the prying process. If the adhesive pad is removed from the system along with the wireless card, adhere it back to the system.

d. Pull the WLAN card to release it from the connector on the system board[4].

NOTE: Ensure NOT to pull the WLAN card more than 35°, to avoid pin damage.



Installing the WLAN card

1. Insert the WLAN card into the slot on the laptop.
2. Route the WLAN cables through the routing channel.

   NOTE: When installing the display assembly or chassis frame onto the system, the wireless and WLAN antennas must be routed correctly into the routing channels on the chassis frame.

3. Connect the WLAN cables to the connectors on the WLAN Card.
4. Place the metal bracket and tighten the M2x3 screw to secures the WLAN card to the system board.
5. Install the:
   a. battery
   b. base cover
6. Follow the procedure in After working inside your system.

WWAN card

Removing WWAN card

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the WWAN card:
   a. Remove the M2.0 x 3.0 screw (1) that secures the metal bracket to the WWAN card [2].

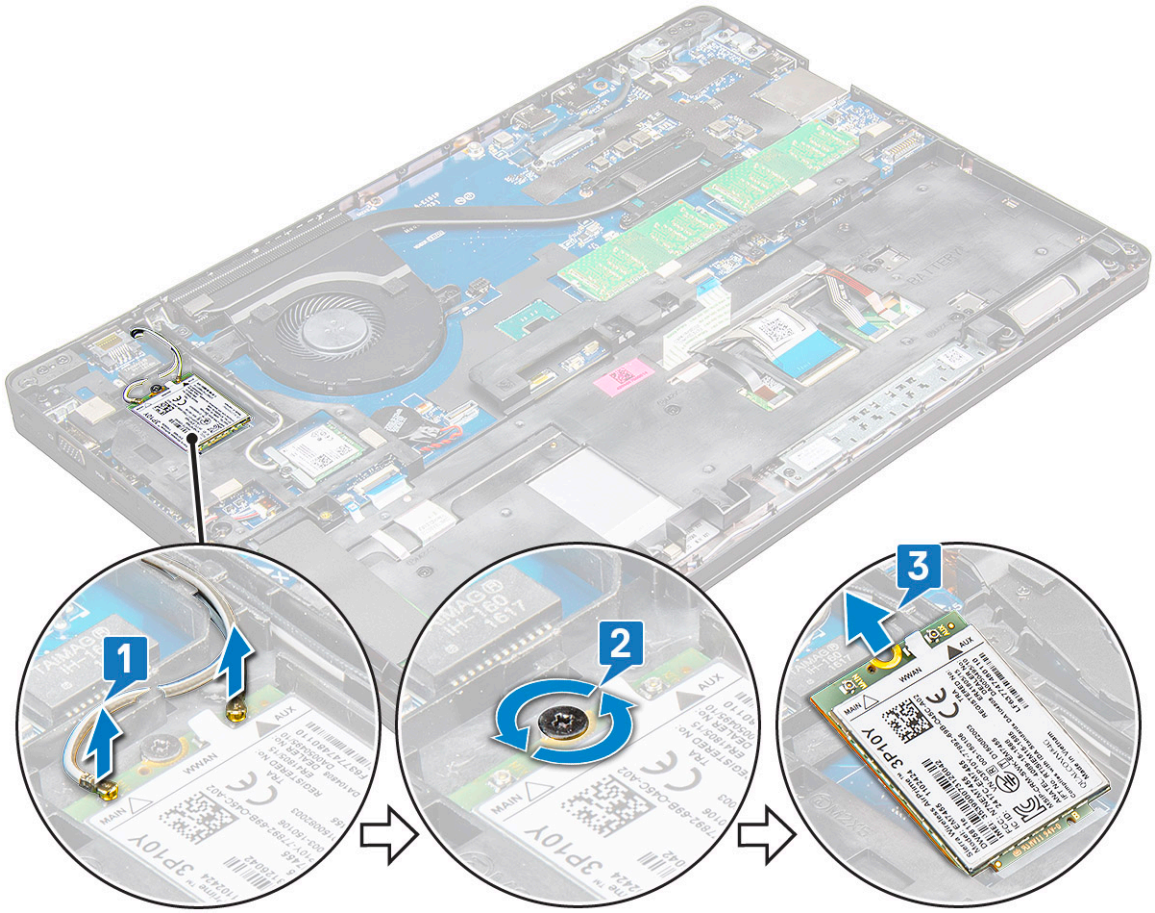
      NOTE: Do not pull the WWAN card more than 35°, to avoid pin damage.

   b. Disconnect the WWAN cables from the connectors on the WWAN card with a plastic scribe.[1].

      NOTE: Do press the WWAN card, and then release the cables from the connectors.

   c. Pull the WWAN card to release it from the connector on the system board [3].

      NOTE: Do not lift the WWAN card by an angle more than 35°.



Installing the WWAN card

1. Insert the WWAN card into the slot on the laptop.
2. Connect the WWAN cables to the connectors on the WWAN card.

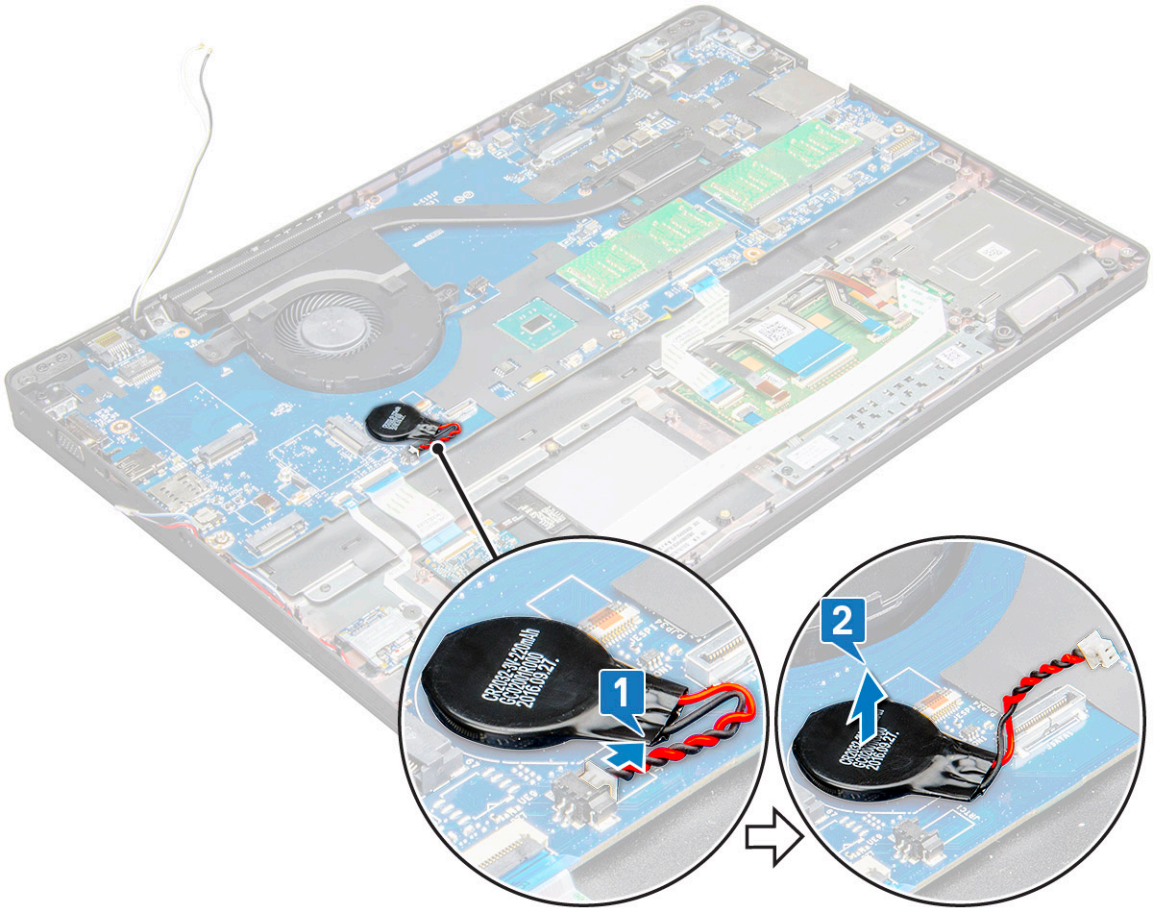
NOTE: When installing the display assembly or chassis frame onto the system, the wireless and WWAN antennas must be routed correctly into the routing channels on the chassis frame.

3. Place the metal bracket and tighten the M2.0 x 3.0 screw to secure it to the laptop.
4. Install the:
   a. battery
   b. base cover
5. Follow the procedure in After working inside your system.

Coin-cell battery

Removing the coin cell battery

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. chassis frame
3. To remove the coin cell battery:
   a. Disconnect the coin cell battery cable from the connector on the system board [1].
   b. Pry the coin cell battery to release from the adhesive and lift it away from the system board [2].



Installing the coin cell battery

1. Place the coin cell battery on the system board.

2. Connect the coin cell battery cable to the connector on the system board.

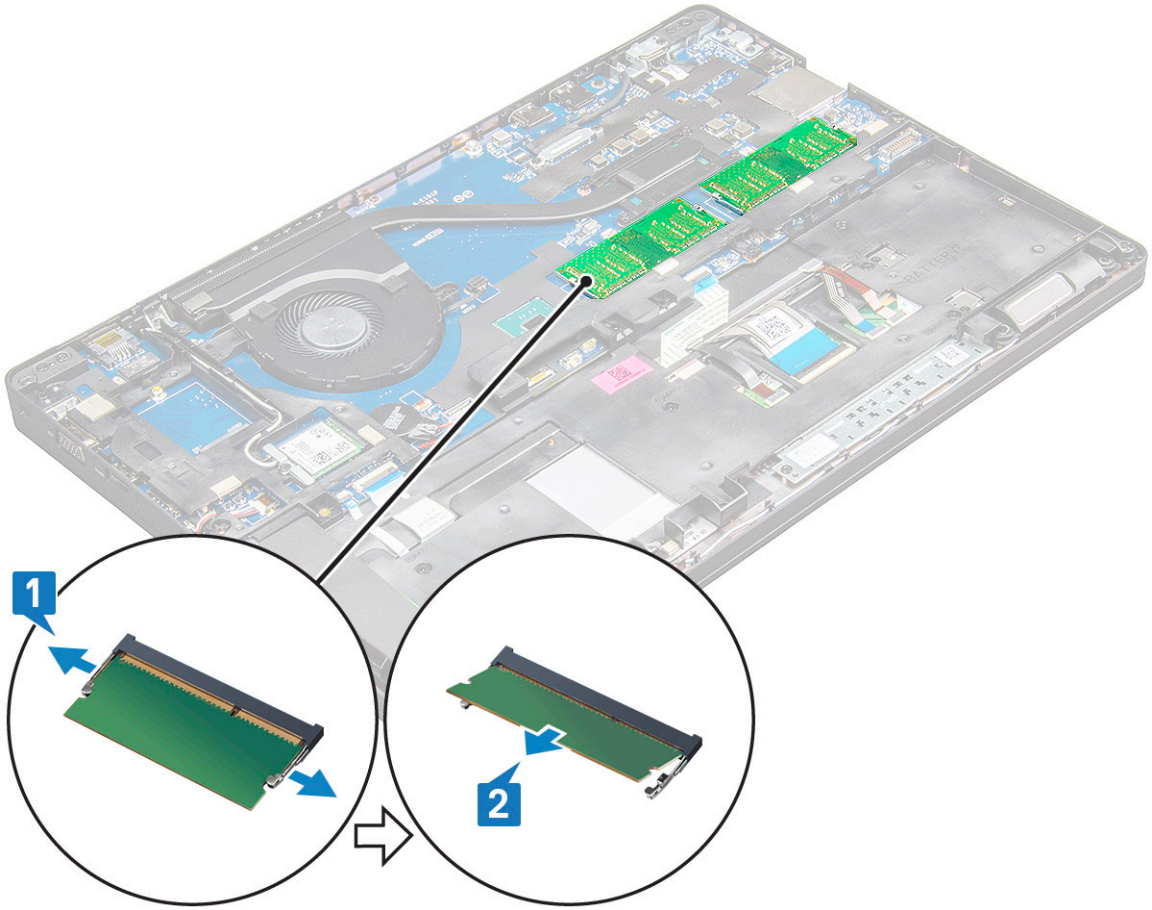
   NOTE: Route the coin cell battery cable carefully to avoid damaging the cable.

3. Install the:
   a. chassis frame
   b. battery
   c. base cover
4. Follow the procedure in After working inside your computer.

Memory modules

Removing the memory module

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the memory module:
   a. Press the clips securing the memory module until the memory pops-up [1].
   b. Pull the memory module from the connector on the system board [2].



Installing the memory module

1. Insert the memory module into the memory module socket then press downward until the clips secure the memory module.

NOTE: Ensure to insert the memory module at an angle NOT more than 30°. Press the memory module down to engage the retaining clips.

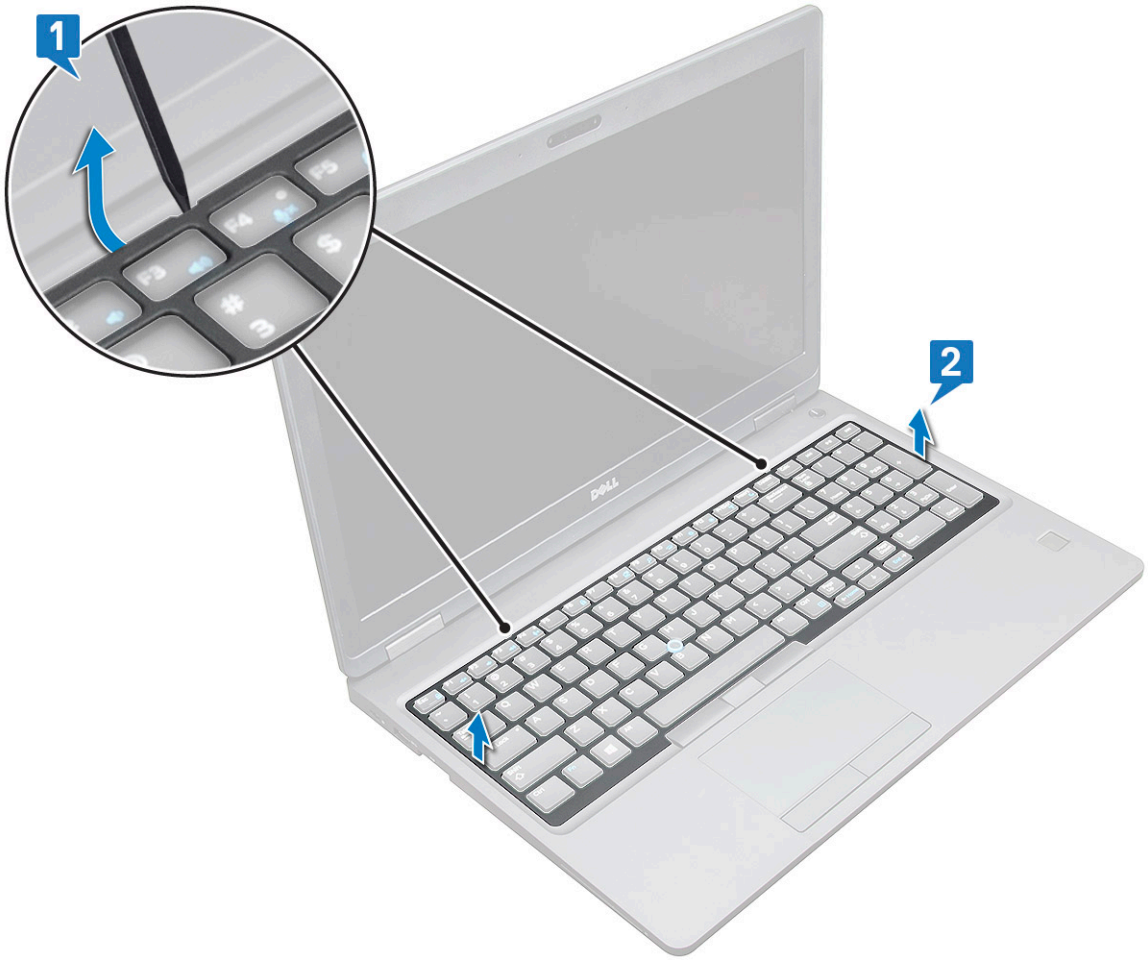
2. Install the:
   a. battery
   b. base cover
3. Follow the procedures in After working inside your computer.

Keyboard lattice and Keyboard

Removing keyboard shroud

1. Follow the procedure in Before working inside your computer.
2. Pry the keyboard shroud from one of the recess points [1] and lift the shroud from the system [2].

NOTE: Gently pull or lift keyboard shroud in clockwise or anticlockwise direction to avoid breakage.



NOTE: Use a plastic scribe to pry the keyboard shroud from the pry points and move around the shroud for removal.

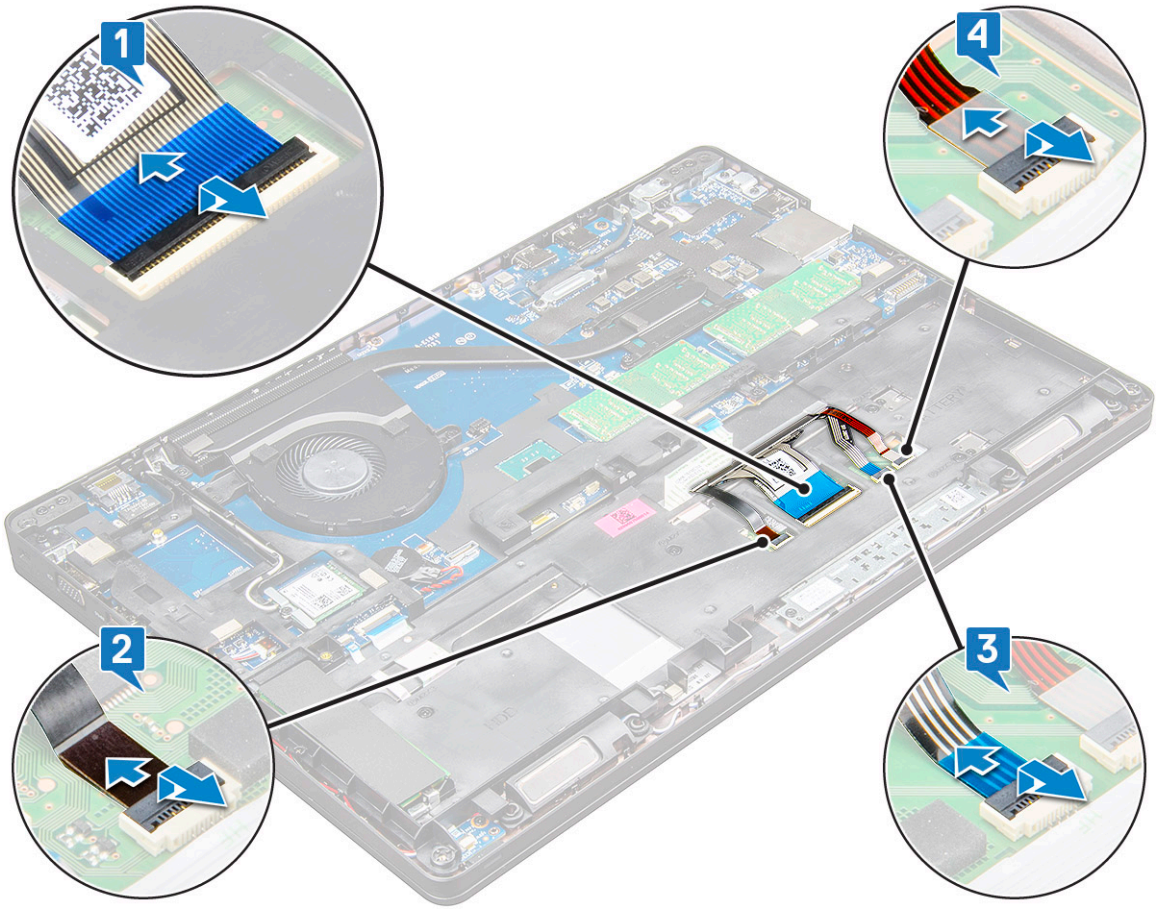
Removing the keyboard

1. Follow the procedure in Before working inside your computer.
2. Remove the:

a. base cover
b. battery
c. keyboard lattice

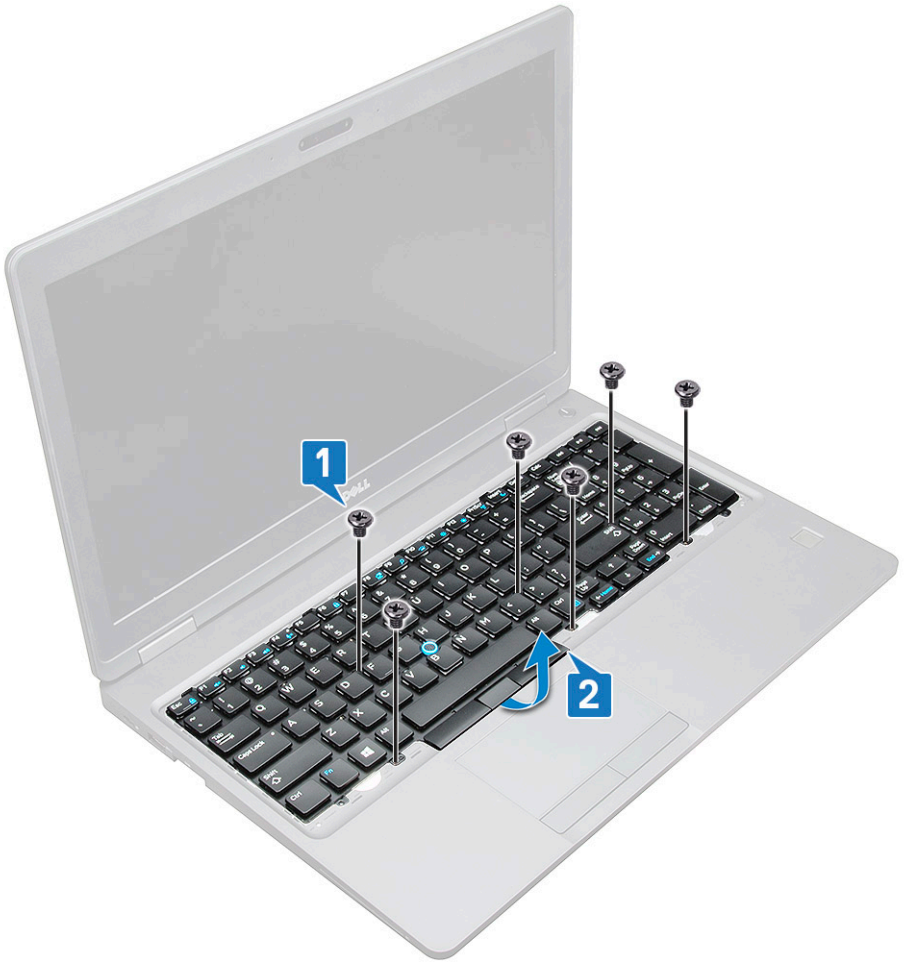
3. To remove the keyboard:
   a. Lift the latch and disconnect the keyboard cable from the connector on the system [1].
   b. Lift the latch and disconnect the keyboard backlight cable from the connector on the system [2].

      NOTE: Number of cables to disconnect is based on the keyboard type.



   c. Lift the latch and disconnect the cable from the connector on the system board [3].
   d. Lift the latch and disconnect the cable from the connector on the system board [4].
   e. Turn over the system and open the laptop in front view mode.
   f. Remove the M2 x 2.5 (6) screws that secure the keyboard to the system [1].
   g. Flip the keyboard from the bottom and lift it from the system along with the keyboard cable and the keyboard back light cable [2].

      WARNING: Gently pull the keyboard cable and the keyboard back light cable routed beneath the chassis frame to avoid damaging the cables.


1
2

Installing the keyboard

1. Hold the keyboard and route the keyboard cable and the keyboard backlight cables through the palmrest in the system.
2. Align the keyboard with the screw holders on the system.
3. Replace the M2*2 screws (6) to secure the keyboard to the system.
4. Turn the system over and connect the keyboard cable and the keyboard backlight cable to the connector in the system.

   NOTE: When reinstalling the chassis frame ensure the keyboard cables are NOT under the lattice , but run through the opening in the frame before connecting them to system board.

5. Install the:
   a. keyboard lattice
   b. battery
   c. base cover
6. Follow the procedure in After working inside your computer.

Installing the keyboard shroud

1. Align the keyboard shroud with the tabs on the computer and press the keyboard until the keyboard clicks into place.
2. Follow the procedure in After working inside your system.

Heat sink

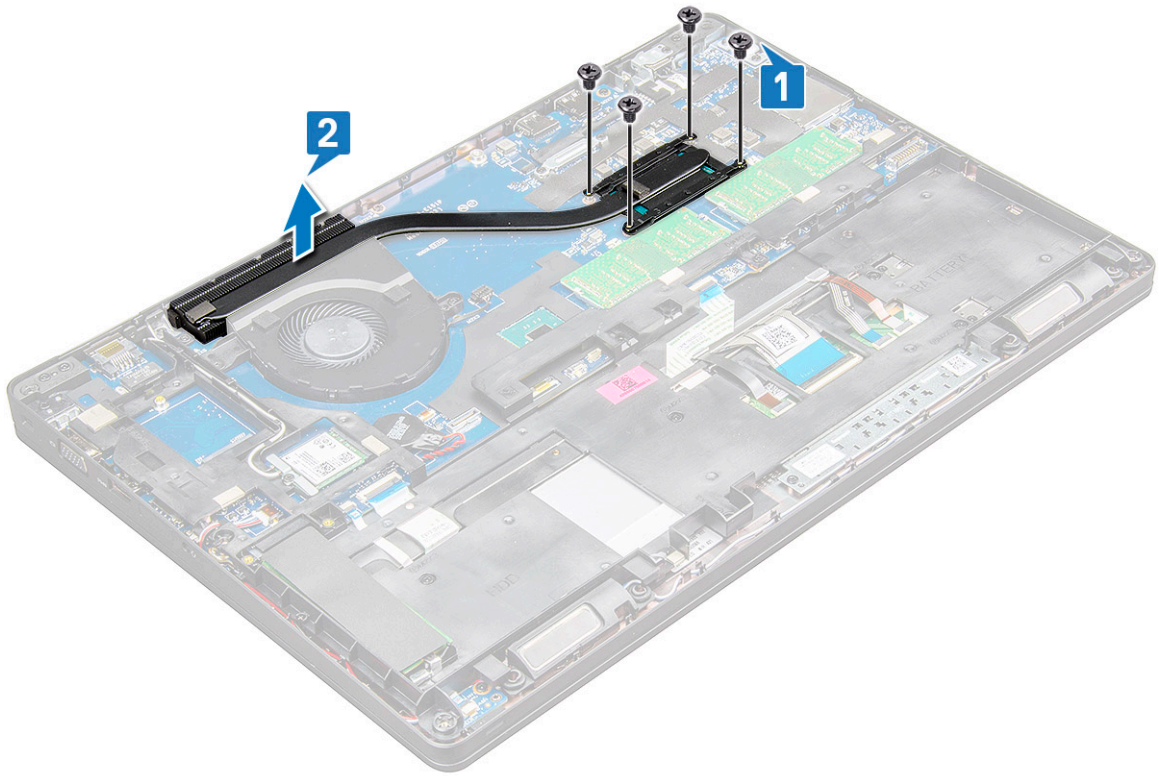
Removing the heat sink

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the heat sink - UMA:
   a. Remove the M2x3 screws (4) that secures the heat sink to the system board [1].

      NOTE: Remove the screws that secure the heat sink .

   b. Lift the heat sink away from the system board [2].

      NOTE: On systems with one piece heat sink and fan assembly there may also be screws on the fan that has to be removed before the entire assembly is removed.



Installing the heat sink

1. Place the heat sink on the system board and align the heat sink with the screw holders.
2. Tighten the M2x3 screws (2) to secure the heat sink to the system board.
3. Connect the heat sink assembly to the connector on the system board.
4. Install the:
   a. battery
   b. base cover
5. Follow the procedure in After working inside your computer.

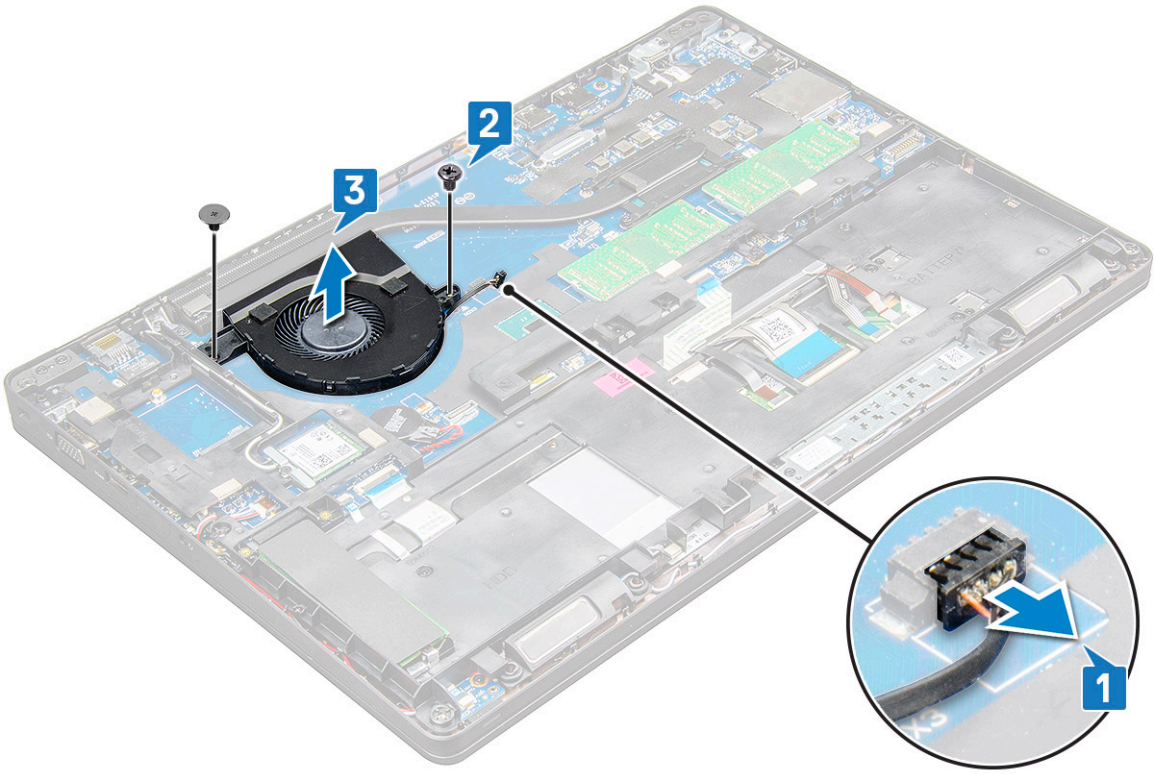
System fan

Removing the system fan

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the system fan:
   a. Disconnect the system fan cable from the connector on the system board [1].
   b. Remove the M2x3 screws (2) that secures the system fan to the system board [2]

      NOTE: Some system may have a integrated heat sink and system fan.

   c. Lift the system fan away from the system board [3].



Installing the system fan

1. Place the system fan on the system board and align the system fan on the screw holders.
2. Tighten the M2x3 screws to secure the heat sink to the system board.
3. Connect the fan cable to the connector on the system board.
4. Install the:
   a. battery
   b. base cover
5. Follow the procedure in After working inside your computer.

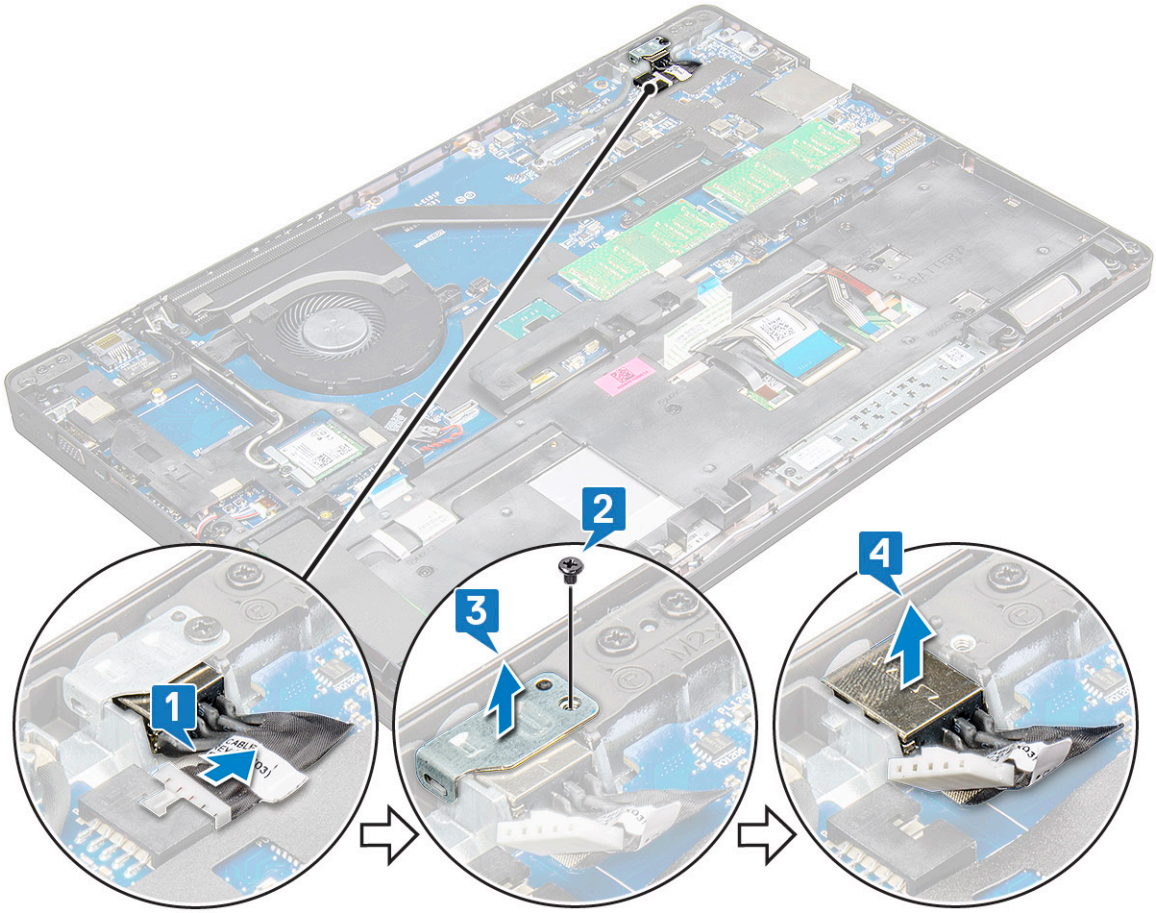
Power connector port

Removing the power connector port

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
3. To remove the power connector port:
   a. Disconnect the power connector port cable from the connector on the system board [1].

      NOTE: Use a plastic scribe to release the cable from the connector. Do not pull the cable as it may result in breakage.

   b. Remove the M2x3 screw to release the metal bracket that secures the power connector port [2].
   c. Remove the metal bracket that secures the power connector port [3].
   d. Lift the power connector port away from the laptop [4].



Installing the power connector port

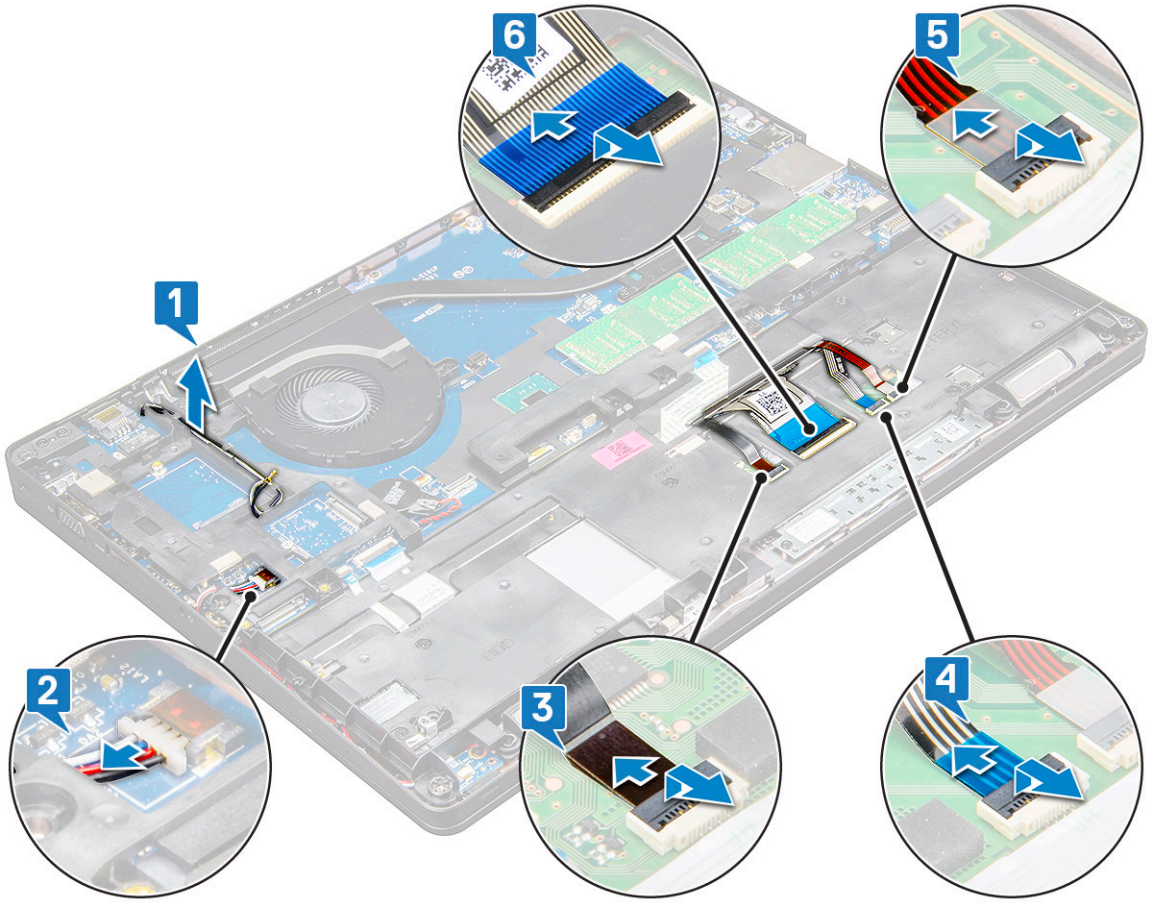
1. Insert the power connector port into the slot on the laptop.
2. Place the metal bracket on the power connector port.
3. Tighten the M2x3 screw to secure the metal bracket to the power connector port on the laptop.
4. Connect the power connector port cable to the connector on the system board.
5. Install the:
   a. battery
   b. base cover
6. Follow the procedure in After working inside your computer.

Chassis Frame

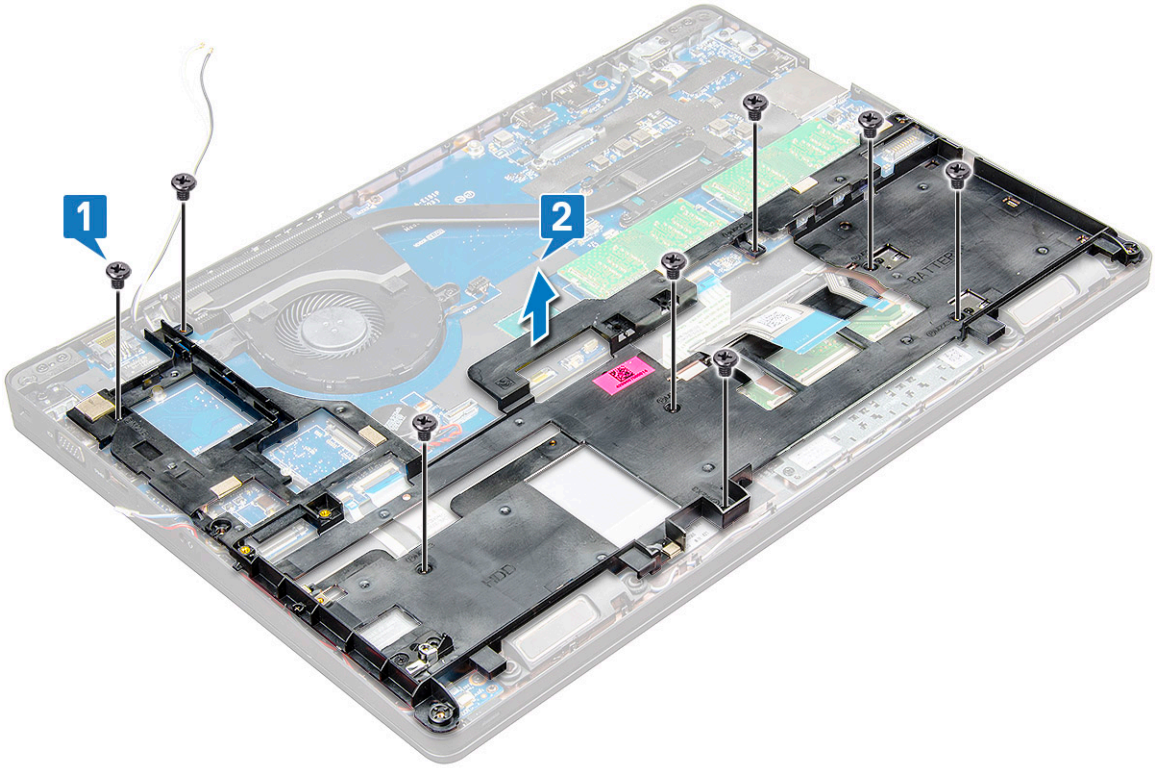
Removing the chassis frame

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. SIM card module
   b. base cover
   c. battery
   d. WLAN card
   e. WWAN
   f. SSD card
3. To release the chassis frame:

a. Release the WLAN and WWAN cables from the routing channels [1].
b. Disconnect the speaker cable from the connector on the system board [2].
c. Lift the latch to disconnect the backlight cable (optional) [3], touchpad cable [4], pointstick cable [5], and keyboard cable [6] from the connector on the system board.



4. To remove the chassis frame:
   a. Remove the M2x3 (5), M2x5 (2) screws that secure the chassis frame to the laptop[1].
   b. Lift the chassis frame away from the laptop [2].



Installing the chassis frame

1. Place the chassis frame on the computer and tighten the screws M2x5 (2), M2x3 (5).

   NOTE: When reinstalling the chassis frame ensure the keyboard cables are NOT under the frame, but run through the opening in the frame.

2. Connect the speaker, keyboard cable, touchpad cable, pointstick cable and backlight cable(optional).
3. Route the WLAN and WWAN cable.

   NOTE: Ensure the coin cell battery cable is properly routed in between the chassis frame and the system board to avoid damages to the cable.

4. Install the:
   a. SSD card
   b. WWAN card
   c. WLAN card
   d. battery
   e. base cover
   f. SIM card module
5. Follow the procedure in After working inside your system.

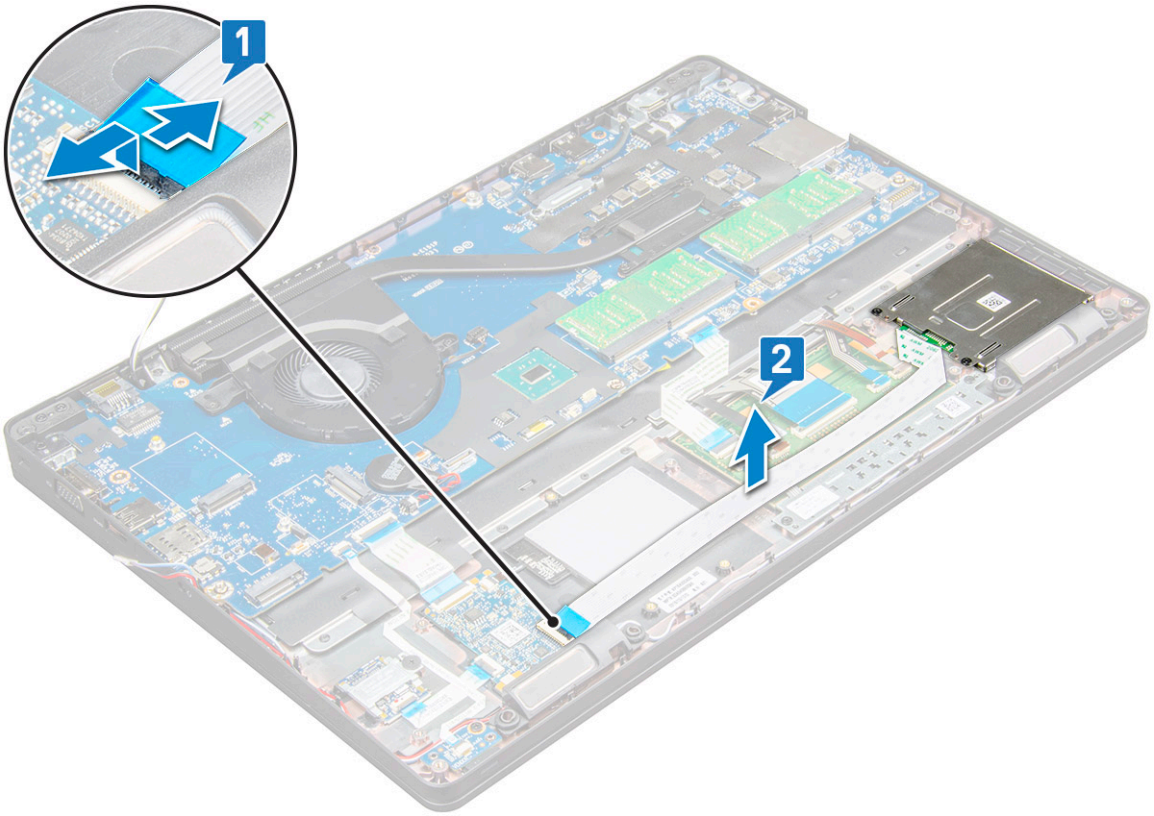
Touchpad

Removing the touchpad button board

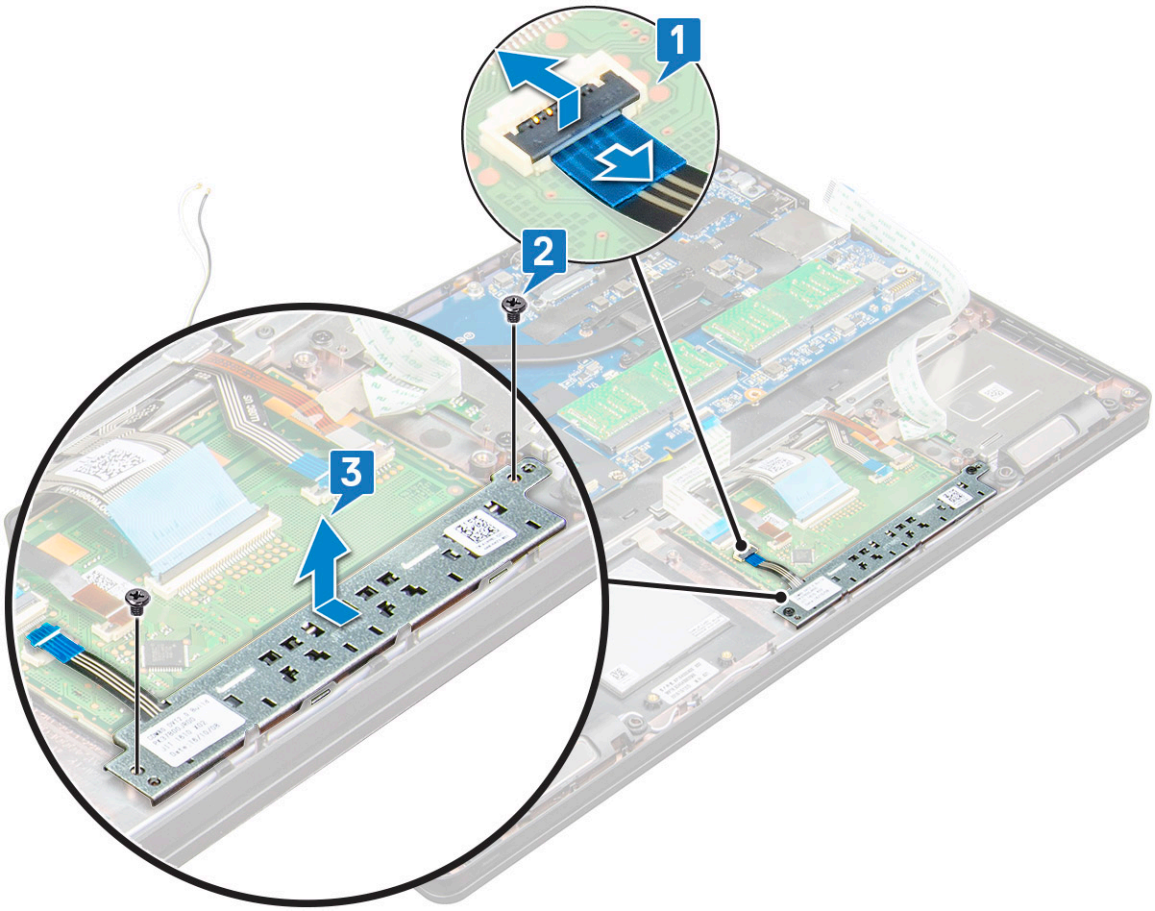
1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery

c. WLAN card
d. WWAN
e. SSD card or hard drive
f. chassis frame

3. To release the touchpad button board:
   a. Lift the latch and disconnect the SmartCard reader cable from the connector on the system board [1].
   b. Peel off the SmartCard reader cable from the adhesive [2].



4. To remove the touchpad button board:
   a. Lift the latch and disconnect the touchpad button board cable from the connector on the system board [1].
   b. Remove the M2x3 screws (2) that secure the touchpad button board to the laptop [2].
   c. Lift the touchpad button board away from the laptop [3].



Installing the touchpad button board

1. Insert the bottom edge of the Button Board under the plastic holder tabs first when placing the buttons board back into the chassis.
2. Tighten the M2x3 screws to secure the touchpad panel.
3. Connect the touchpad button board cable.
4. Connect the SmartCard reader cable to the laptop.
5. Install the:
   a. chassis frame
   b. SSD card or hard drive
   c. WLAN card
   d. battery
   e. base cover
6. Follow the procedure in After working inside your computer.

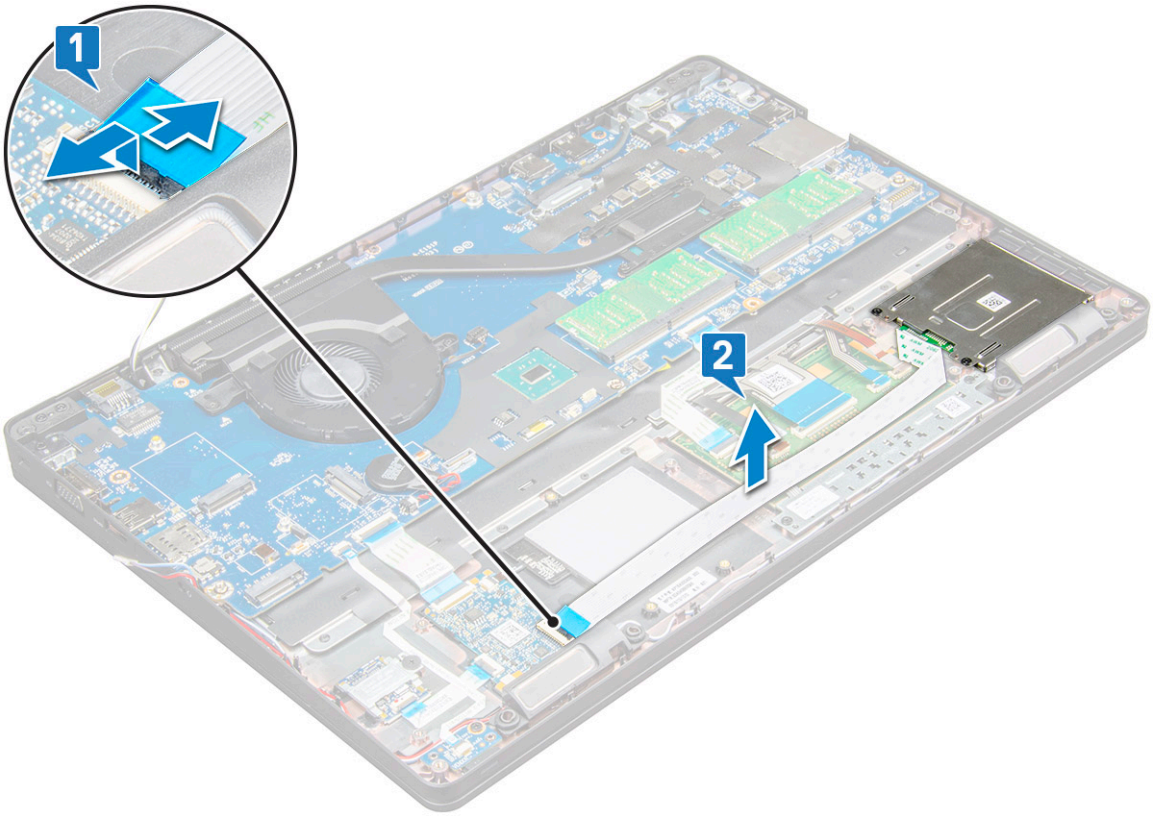
SmartCard module

Removing the SmartCard reader

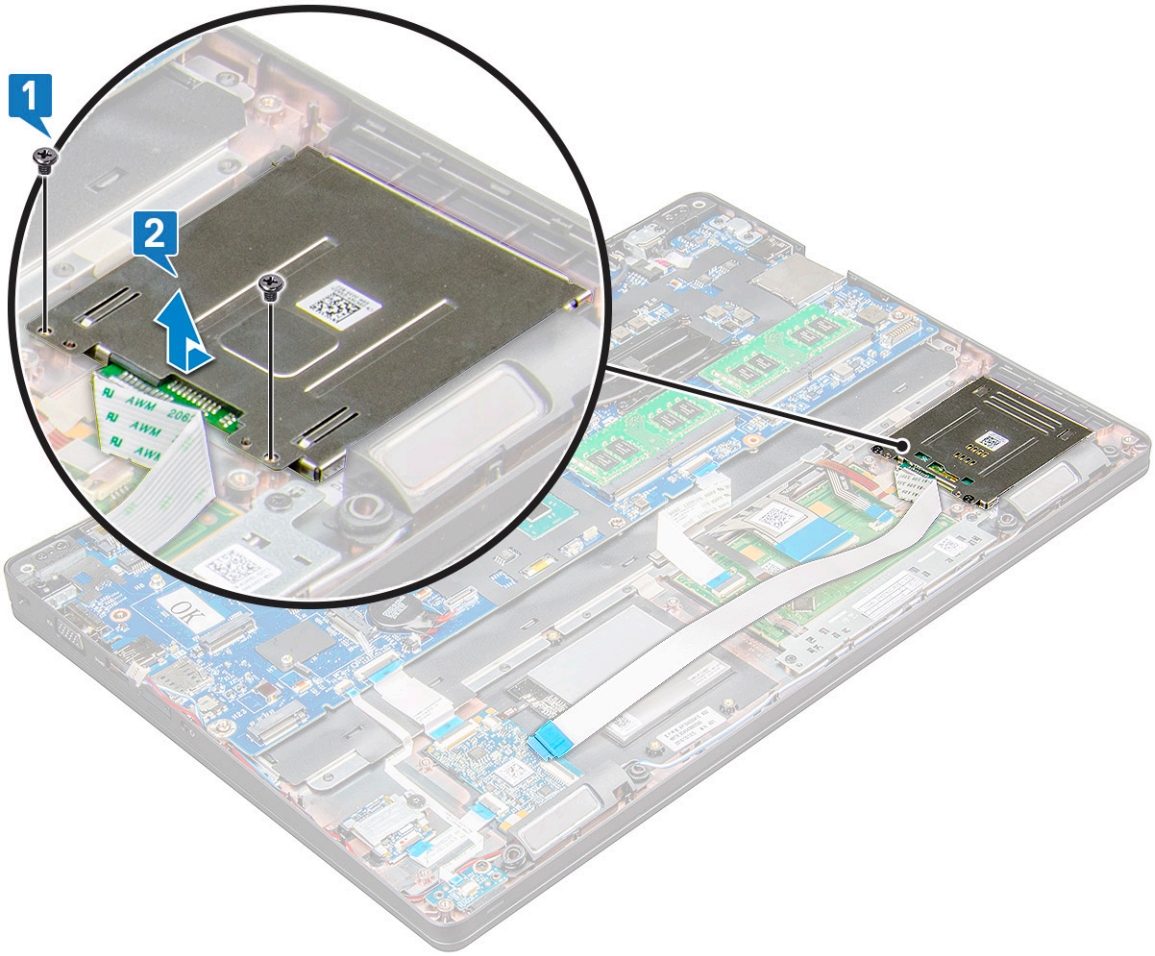
1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WLAN card

d. WWAN
e. SSD card
f. chassis frame

3. To release the SmartCard reader:
   a. Disconnect the SmartCard reader board cable from the connector on the system board [1].
   b. Peel off the cable to release from the adhesive [2].



4. To remove the SmartCard reader:
   a. Remove the M2x3 screws (2) that secure the SmartCard reader board to the palmrest [1].
   b. Pull the SmartCard reader board to release on the system board [2].



Installing the SmartCard reader

1. Place the SmartCard reader on the laptop.
2. Tighten the M2x3 screws to secure the SmartCard reader to the laptop.
3. Affix the SmartCard reader cable and connect the cable to the connector on the system board.
4. Install the:
   a. chassis frame
   b. SSD card
   c. WLAN card
   d. battery
   e. base cover
5. Follow the procedure in After working inside your computer.

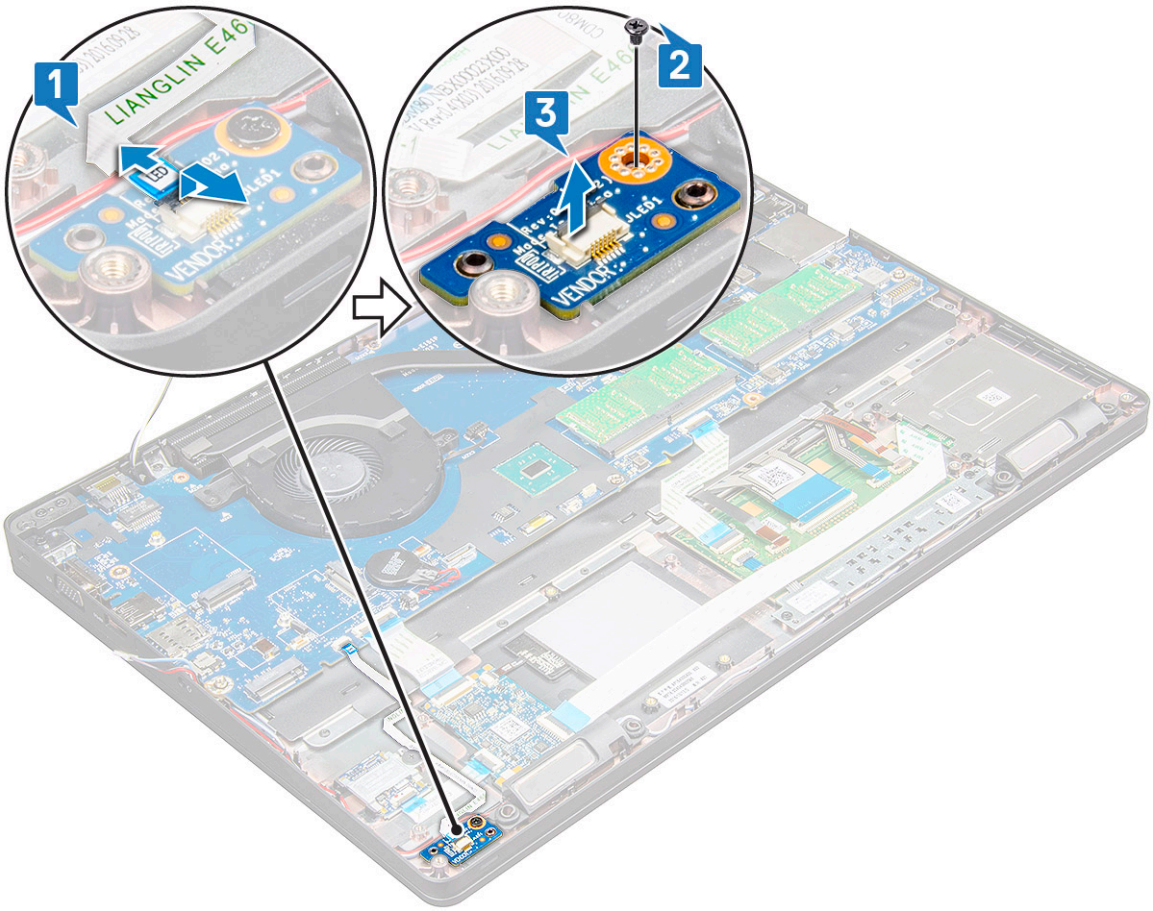
LED board

Removing the LED board

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WLAN card

d. SSD card
e. chassis frame

3. To remove the LED board:
   a. Lift the latch and disconnect the LED board cable from the connector on the LED board [1].
   b. Remove the M2x3 screw that secures the LED board to the laptop [2].
   c. Lift the LED board away from the laptop [3].



Installing the LED board

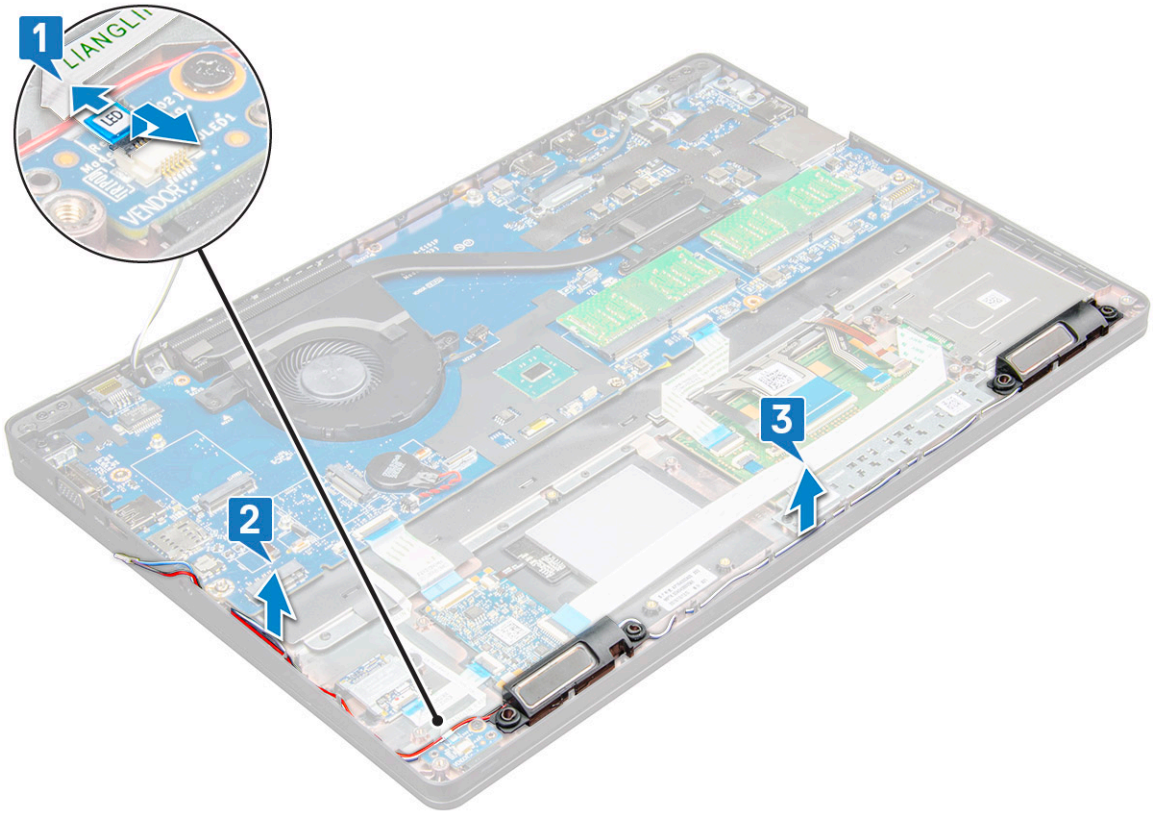
1. Place the LED board on the laptop.
2. Tighten the M2x3 screw to secure the LED board to the laptop.
3. Connect the LED board cable to the connector on the LED board.
4. Install the:
   a. chassis frame
   b. SSD card
   c. WLAN card
   d. battery
   e. base cover
5. Follow the procedure in After working inside your computer.

Speaker

Removing the speaker

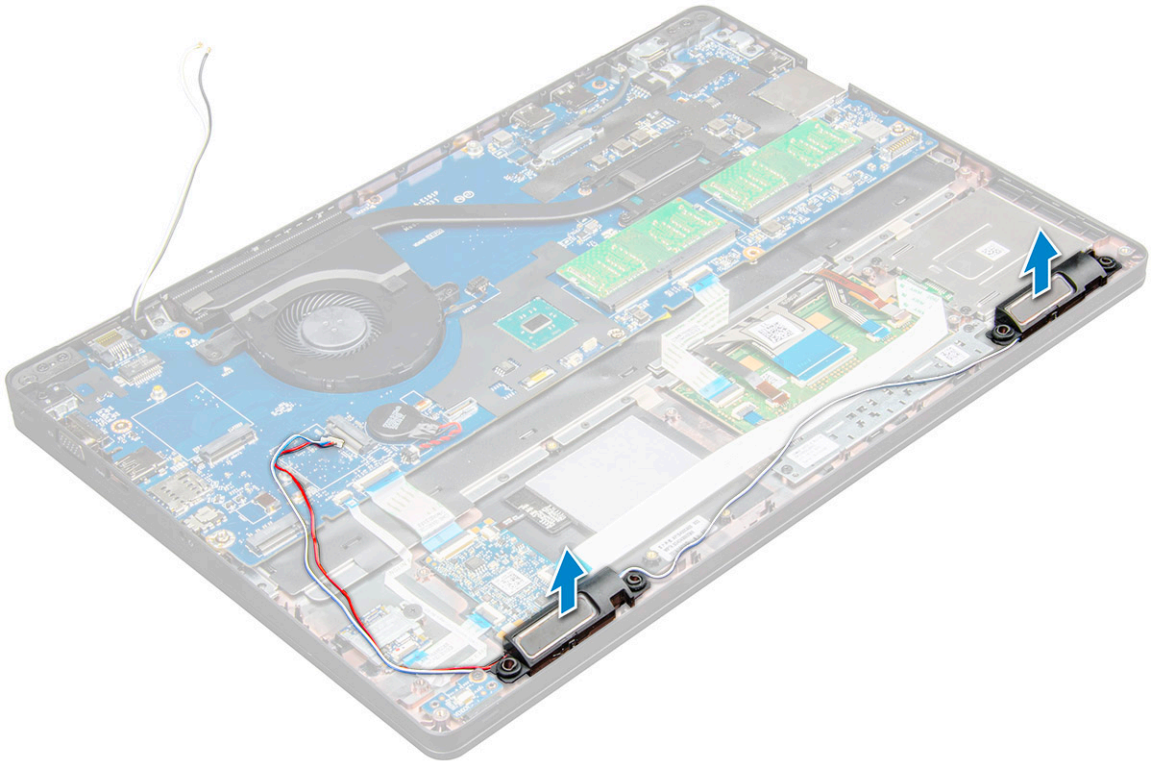
1. Follow the procedure in Before working inside your computer.

2. Remove the:
   a. base cover
   b. battery
   c. WLAN card
   d. WWAN
   e. SSD card
   f. chassis frame
3. To disconnect the cables:
   a. Lift the latch and disconnect the LED board cable [1].
   b. Uunroute the speaker cable [2].
   c. Remove the speaker cable from the routing clips [3].



4. Lift the speakers from the laptop.

NOTE: Speaker are fixed to the laptop in the speaker holder, lift the speaker gently to avoid damage to the holders.



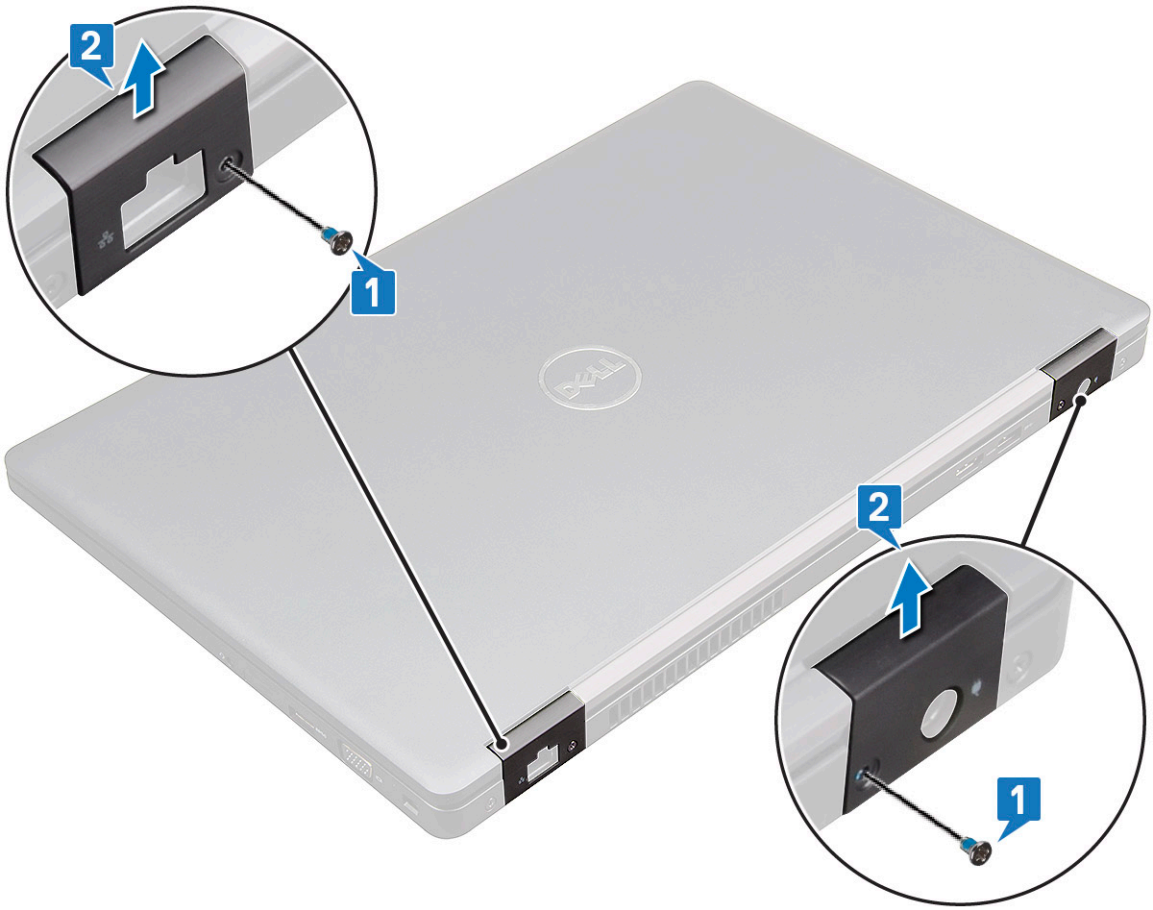
Installing the speaker

1. Place the speakers into the slots on the laptop.
2. Route the speaker cable through the retention clips through the routing channel.
3. Connect the speaker and LED board cable to the laptop.
4. Install the:
   a. chassis frame
   b. SSD card or hard drive
   c. WWAN
   d. WLAN card
   e. battery
   f. base cover
5. Follow the procedure in After working inside your computer.

Display hinge cover

Removing the display hinge cover

1. Follow the procedure in Before working inside your computer.
2. To remove the hinge cover:
   a. Remove the M2x3 screws that secure the hinge cover to the laptop [1].
   b. Remove the hinge cover from the laptop [2].



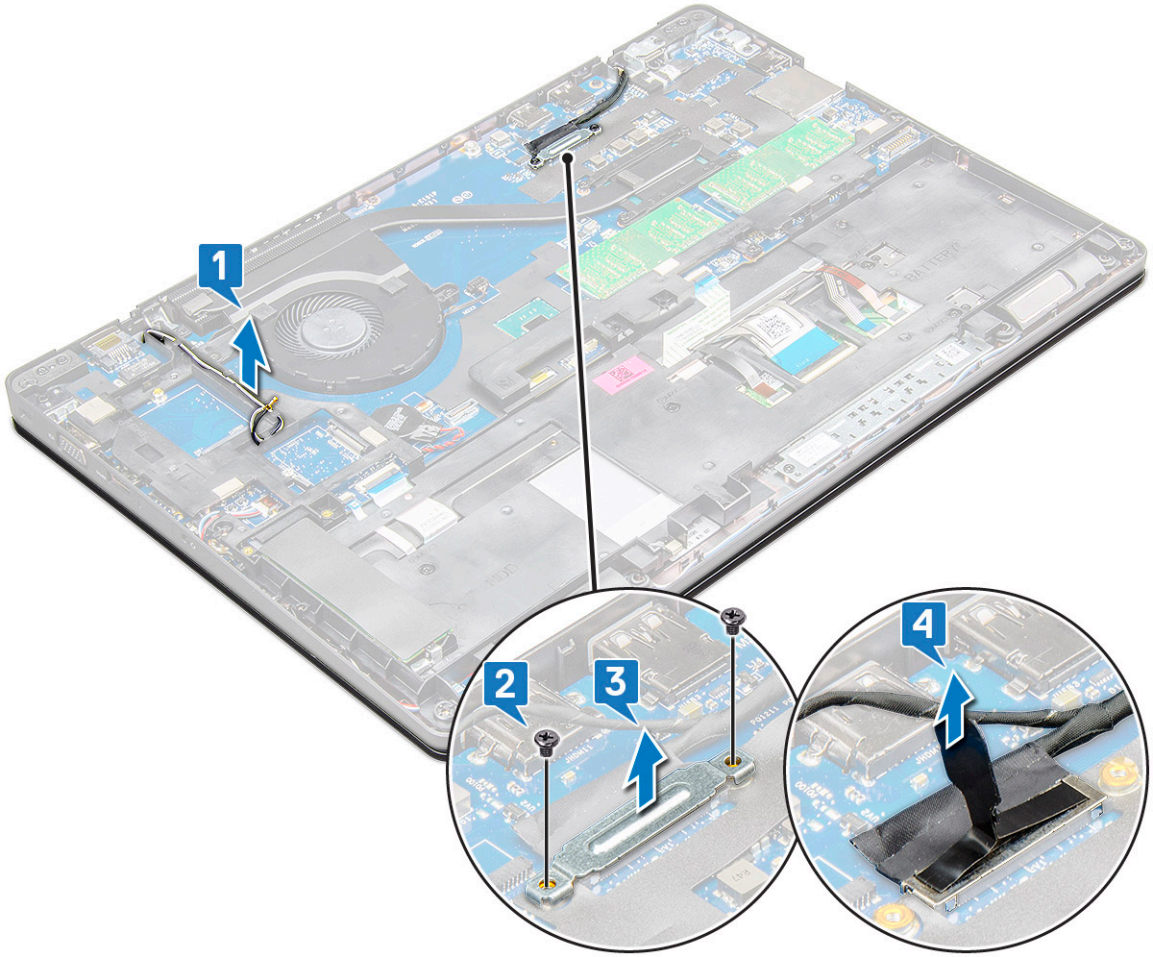
Installing the hinge cover

1. Place the hinge bracket to align with the screw holders on the laptop.
2. Tighten the M2x3 screws to secure the display assembly to the laptop.
3. Follow the procedure in After working inside your computer.

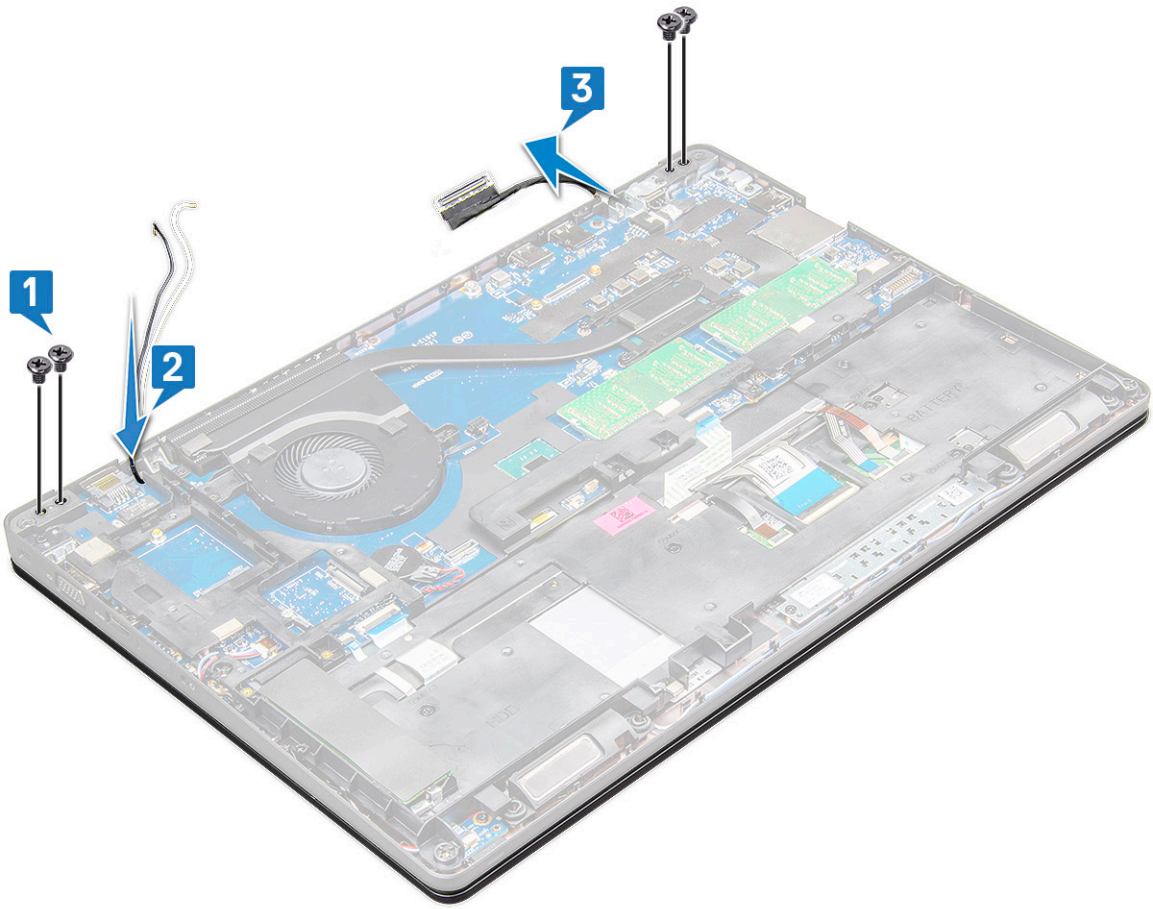
Display assembly

Removing the display assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WWAN
   d. WLAN card
   e. hinge cap
3. To disconnect the display cable:
   a. Release the WLAN cable from the routing channels [1].
   b. Remove the M2x3 screws (2) and lift the metal bracket that secure the display cable on the computer [2,3].
   c. Disconnect the display cable [4].



4. To remove hinge screws:
   a. Remove the M2x5 screws (4) that secure the display assembly to the system board [1].
   b. Release the antenna cables and display cable from the routing channel [2, 3].



5. Turn over the laptop.
6. To remove the display assembly:
   a. Remove the M2x5 screws (2) that secure the display assembly to the laptop [1].
   b. Flip to open the display [2].

7. Slide upward the display assembly away from the system base.

Installing display assembly

1. Place the display assembly to align with the screw holders on the laptop.

   NOTE: Close the LCD before inserting the screws or turning over the laptop.

   CAUTION: Route the display and antenna cable through the LCD hinge mount holes as LCD assembly is inserted into the base, to prevent possible cable damage.

2. Tighten the M2x5 screws to secure the display assembly to the laptop.
3. Turn over the laptop.
4. Connect the antenna cables and display cable to the connectors.
5. Place the display cable bracket over the connector and tighten the M2x5 screws to secure the display cable to the laptop.
6. Connect the IR camera cable.
7. Install the:
   a. hinge cap
   b. WWAN
   c. WLAN card
   d. battery
   e. base cover
8. Follow the procedure in After working inside your computer.

Display bezel

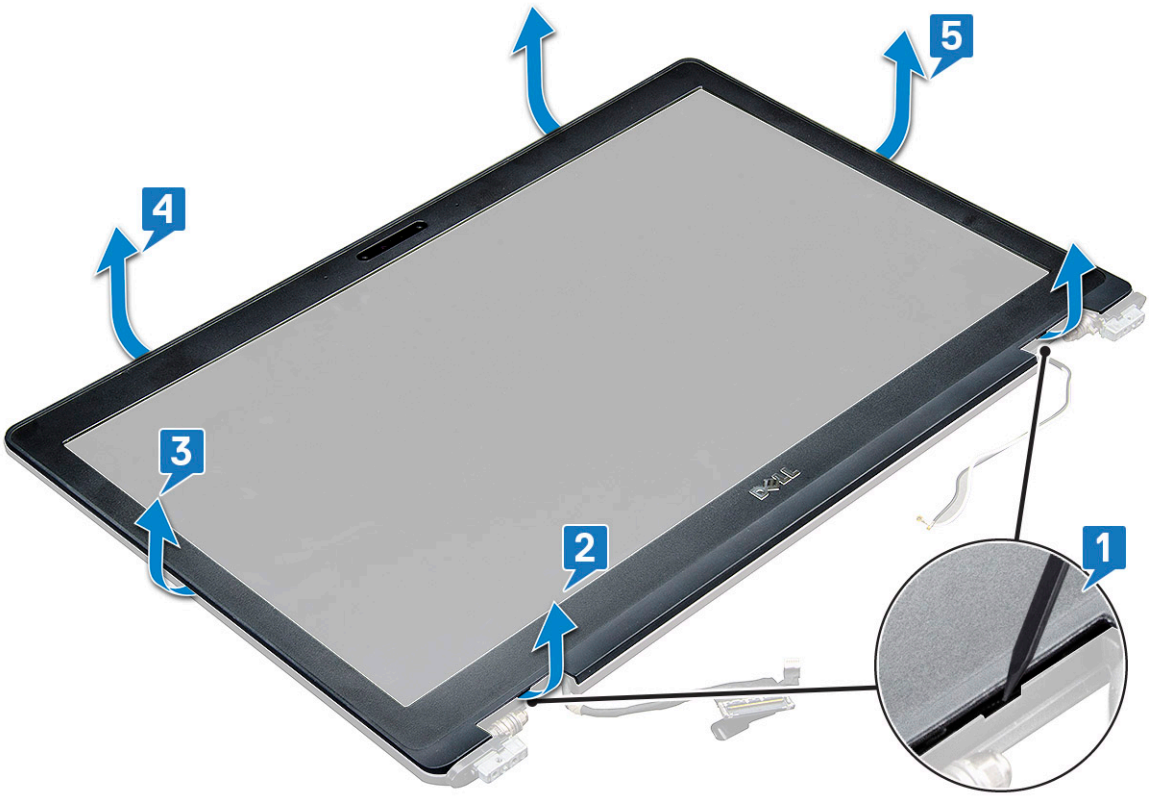
Removing display bezel

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WLAN card
   d. WWAN
   e. display assembly
3. To remove the display bezel:
   a. Pry the display bezel at the base of the display [1].

      NOTE: When removing or reinstalling the display bezel from the display assembly, technicians should note that the display bezel is secured to the LCD panel with a strong adhesive and care must be taken to avoid damage to LCD.

   b. Lift the display bezel to release it [2].
   c. Pry the edges on the side of the display to release the display bezel [3, 4,,5].

      CAUTION: The adhesive used on the LCD bezel to seal it with the LCD itself, makes it hard to remove the bezel as the adhesive is very strong and tends to stay stuck to the LCD portion and can peel the layers up or crack the glass when trying to pry the two items apart.



Installing display bezel

1. Place the display bezel on the display assembly.

   NOTE: Remove the protective covering on the adhesive on the LCD bezel before placing on the display assembly.

2. Starting from a top corner, press clockwise on the display bezel and work around the entire bezel until it clicks on to the display assembly.
3. Install the:
   a. display assembly
   b. WWAN
   c. WLAN card
   d. battery
   e. base cover
4. Follow the procedure in After working inside your computer.

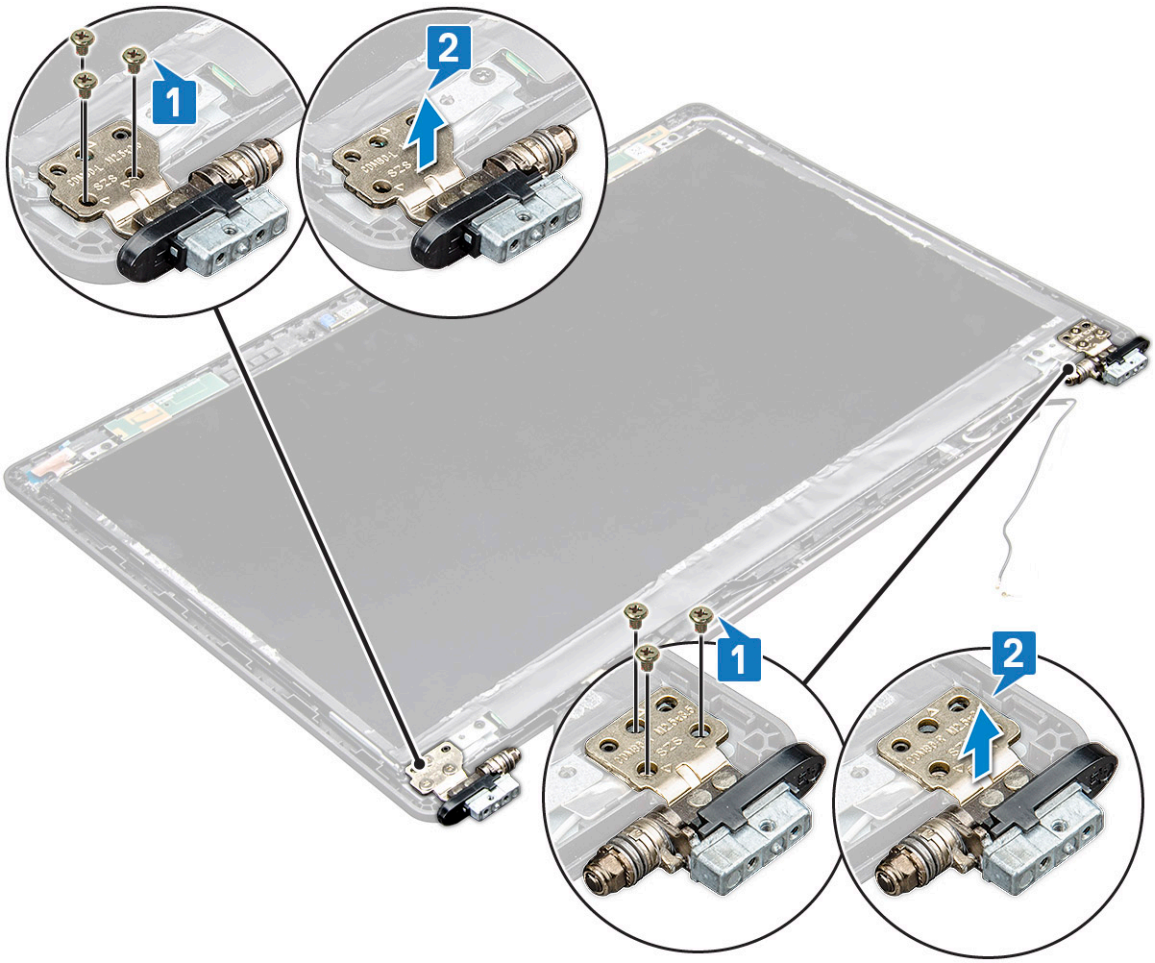
Display hinges

Removing the display hinge

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WWAN
   d. WLAN card
   e. hinge cap
   f. display assembly

g. display bezel

3. To remove the display hinge:
   a. Remove the M2.5x3.5 screws (3) that secure the display hinge to the display assembly [1].
   b. Lift the display hinge away from the display assembly [2].
   c. Repeat the step 3a. and 3b. to remove the other display hinge.



Installing the display hinge

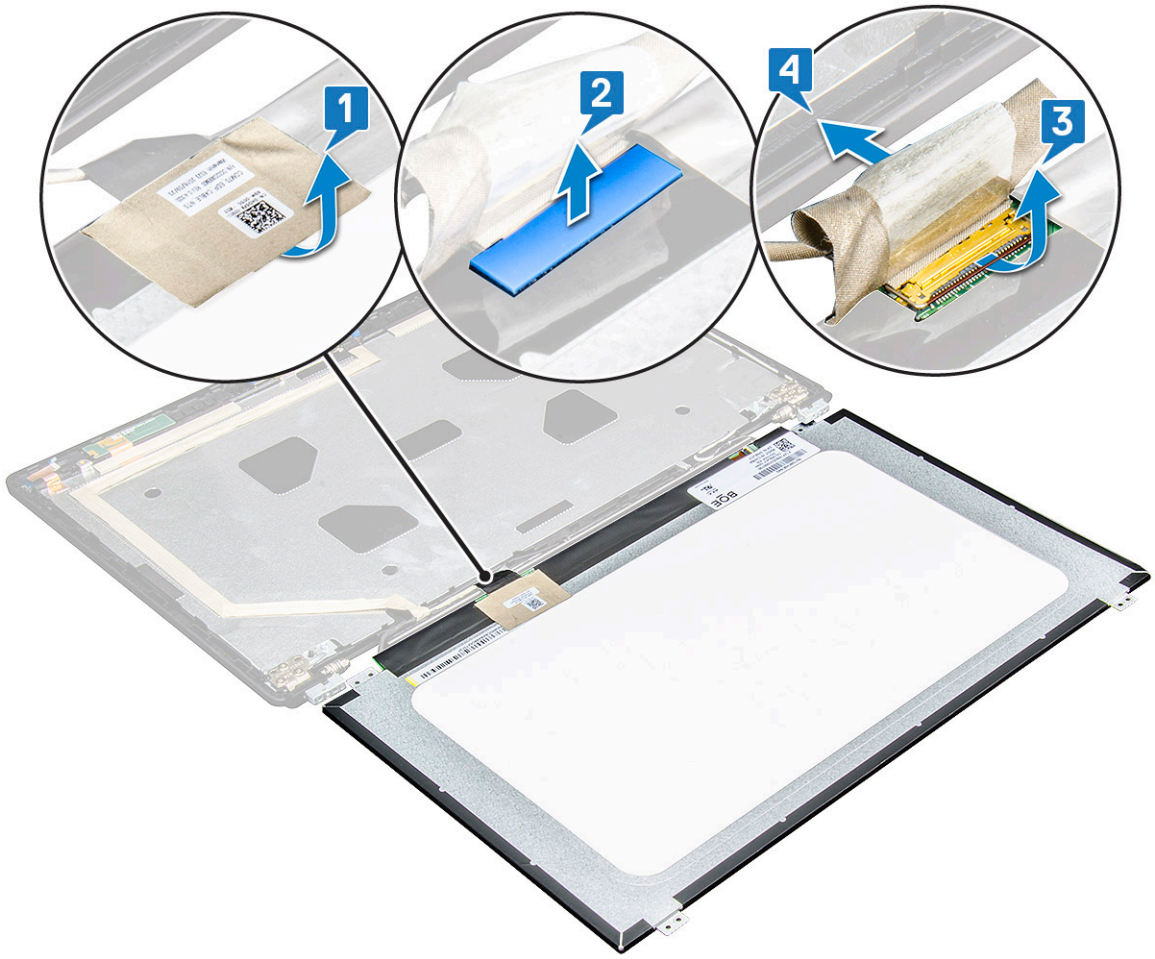
1. Place the display hinge cover on the display assembly.
2. Tighten the M2.5x3.5 screw to secure the display hinge cover to the display assembly.
3. Repeat the same procedure step 1-2 to install the other display hinge cover.
4. Install the:
   a. display bezel
   b. display assembly
   c. hinge cap
   d. WWAN
   e. WLAN card
   f. battery
   g. base cover
5. Follow the procedure in After working inside your computer.

Display panel

Removing the display panel

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WWAN
   d. WLAN card
   e. hinge cap
   f. display assembly
   g. display bezel
3. Remove the M2x3 screws (4) that secure the display panel to the display assembly [1] and lift to turn over the display panel to access the eDP cable [2].

4. To remove the display panel:
   a. Peel off the adhesive tape [1].
   b. Lift the blue tape that secures the display cable [2].
   c. Lift the latch to disconnect the display cable from the connector on the display panel [3, 4].



Installing the display panel

1. Connect the eDP cable to the connector and affix the blue tape.
2. Affix the adhesive tape to secure the eDP cable.
3. Replace the display panel to align with the screw holders on the display assembly.
4. Tighten the M2x3 screws to secure the display panel to the display assembly.
5. Install the:
   a. display bezel
   b. display assembly
   c. hinge cap
   d. WWAN
   e. WLAN card
   f. battery
   g. base cover
6. Follow the procedure in After working inside your computer.

Display (eDP) cable

Removing the eDP cable

1. Follow the procedure in Before working inside your computer.
2. Remove the:

a. base cover
b. battery
c. WWAN
d. WLAN card
e. display assembly
f. Display Panel
g. display bezel

3. Peel off the eDP cable from the adhesive to remove it from the display.

Installing the eDP cable

1. ffix the eDP cable on the display assembly.
2. Install the:
   a. display panel
   b. display bezel
   c. display assembly
   d. hinge cap
   e. WWAN
   f. WLAN card
   g. battery
   h. base cover
3. Follow the procedure in After working inside your computer.

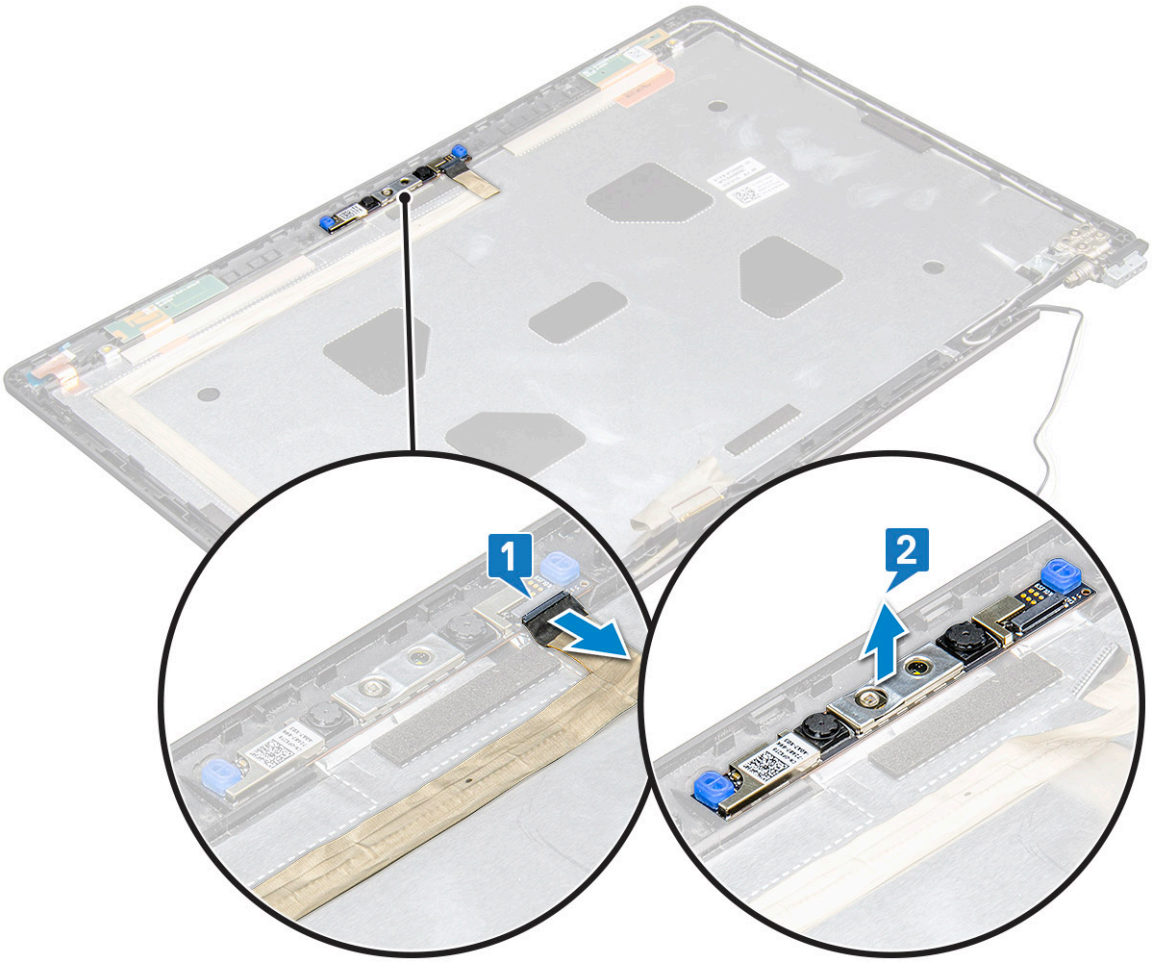
Camera

Removing camera

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover

b. battery
c. WLAN
d. WWAN
e. display assembly
f. display bezel
g. display panel

3. To remove the camera:
   a. Disconnect the camera cable from the connector on the camera module, on the display panel[1].
   b. Carefully pry and lift the camera module from the display back cover [2].



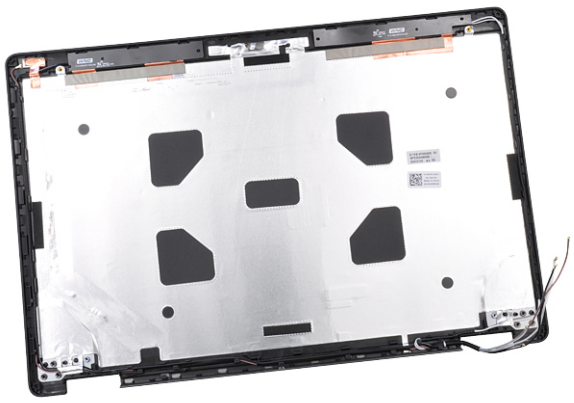
Installing camera

1. Insert the camera into the slot on the display back cover.
2. Connect the display cable to the connector.
3. Affix the two conductive tape above the camera.
4. Install the :
   a. display panel
   b. display bezel
   c. display assembly
   d. WLAN
   e. WWAN
   f.
   g. battery
   h. base cover
5. Follow the procedure in After working inside your computer.

Display back cover assembly

Removing the display back cover assembly

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. WWAN card
   d. WLAN card
   e. display assembly
   f. display hinge
   g. display bezel
   h. display panel
   i. eDP cable
   j. camera
3. The display back cover assembly is the remaining component, after removing all the components.



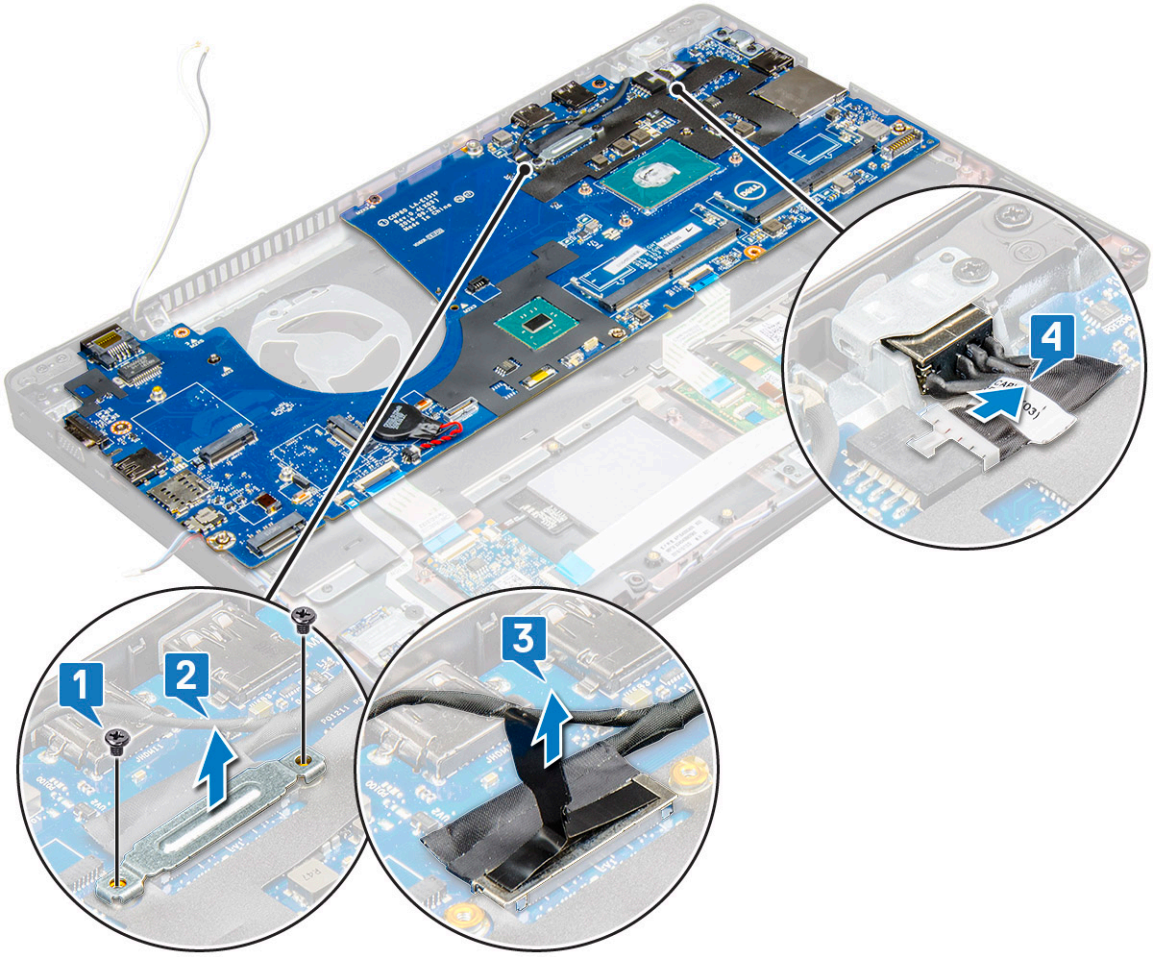
Installing the display back cover assembly

1. The display back cover assembly is the remaining component, after removing all the components.
2. Install the:
   a. camera
   b. eDP cable
   c. display panel
   d. display bezel
   e. display assembly
   f. display hinge
   g. WWAN card
   h. WLAN card
   i. battery
   j. base cover
3. Follow the procedure in After working inside your computer.

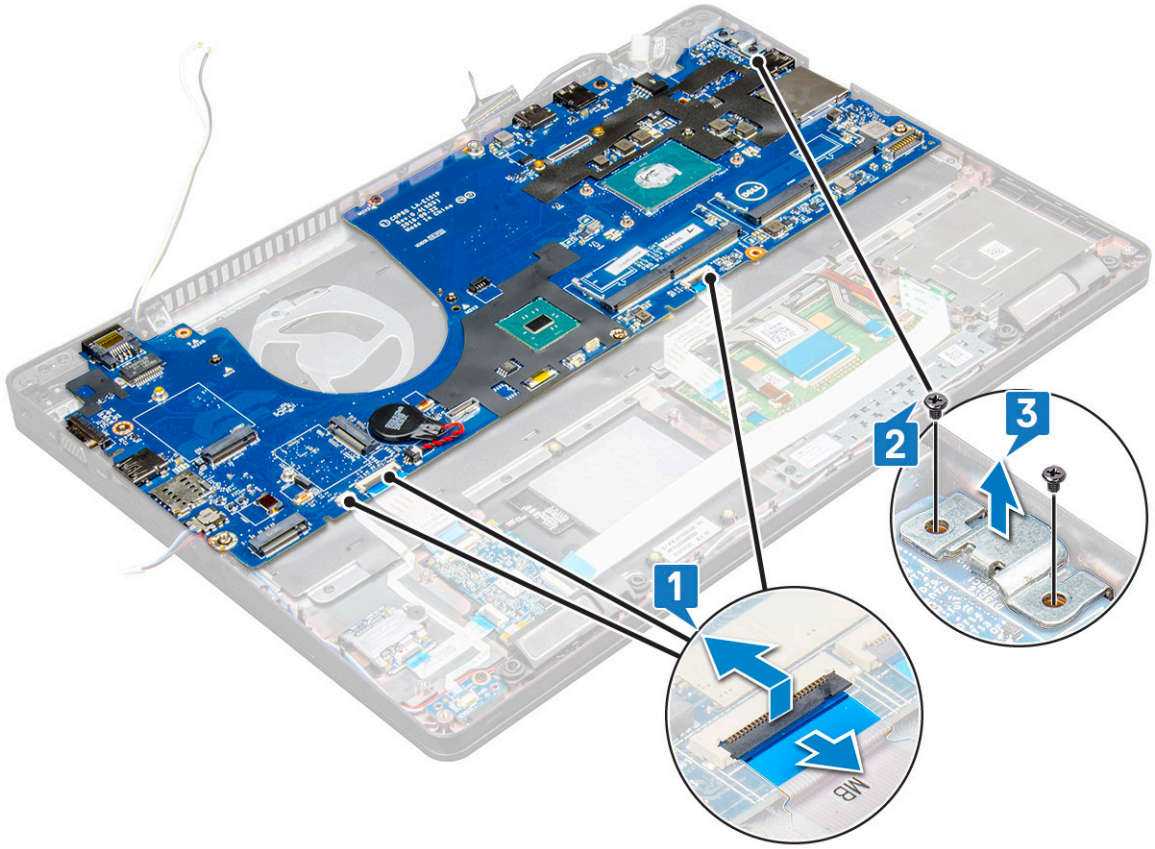
System board

Removing the system board

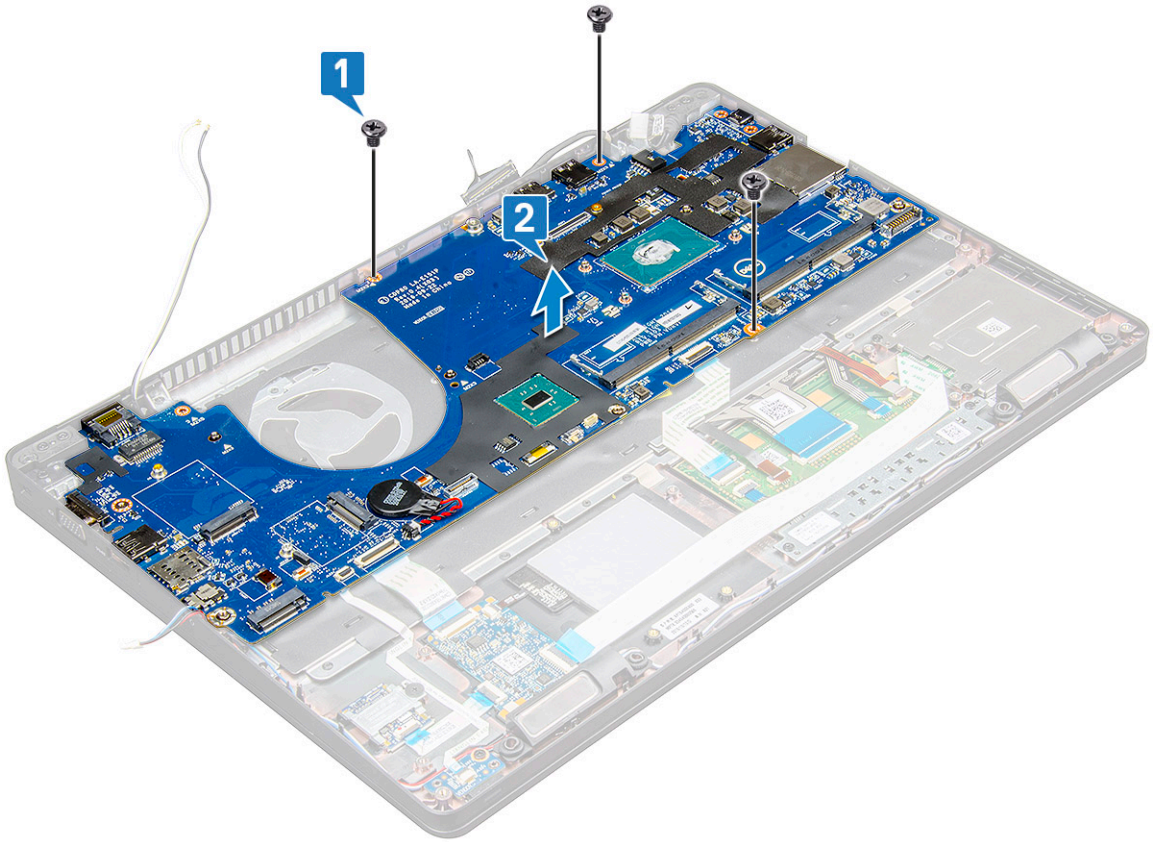
1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. SIM card module
   b. base cover
   c. battery
   d. WLAN card
   e. WWAN card
   f. SSD card or hard drive
   g. memory module
   h. heat sink
   i. chassis frame
3. To release the system board:
   a. Remove the M2x5 screws that secures the metal bracket to the system board [1].
   b. Lift the metal bracket that secures the display cable to the system board [2].
   c. Disconnect the display cable from the connectors on the system board [3].
   d.



4. To remove the system board:
   a. Lift the latch and disconnect the LED board, mother board and touchpad cable from the connectors on the system board [1].
   b. Remove the M2x5 screws (2) that secure the metal USB-C port bracket to the system board and lift the bracket away from the system board [2,3].



5. Remove the M2x3 screws (3) and lift the system board away from the computer [1, 2].



Installing the system board

1. Align the system board with the screw holders on the laptop.
2. Tighten the M2x3 screws to secure the system board to the laptop.
3. Place the metal USB-C bracket and tighten the M2x5 screws on the system board.
4. Connect the LED, mother board and touchpad cable to the system board.
5. Connect the display cable on the system board.
6. Place the eDP cable and metal bracket to system board and tighten the M2x3 screws to secure to the system board.
7. Install the:
   a. chassis frame
   b. heat sink
   c. memory module
   d. SSD card or hard drive
   e. WWAN card
   f. WLAN card
   g. battery
   h. base cover
   i. SIM card module
8. Follow the procedure in After working inside your computer.

Palm rest

Replacing the palm rest

1. Follow the procedure in Before working inside your computer.
2. Remove the:
   a. base cover
   b. battery
   c. keyboard
   d. WLAN card
   e. WWAN card
   f. SSD card
   g. hard drive
   h. memory module
   i. Touchpad
   j. heat sink
   k. coin cell battery
   l. chassis frame
   m. system board
   n. hinge cap
   o. display assembly

   NOTE: The component you are left with is the palm rest.

3. Install the following components on the new palm rest.
   a. display assembly
   b. hinge cap
   c. system board
   d. chassis frame
   e. coin cell battery
   f. heat sink
   g. Touchpad
   h. memory module
   i. SSD card
   j. WLAN card
   k. keyboard
   l. battery
   m. base cover
4. Follow the procedure in After working inside your computer.

3

Technology and components

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

Topics:

Power adapter

This laptop is shipped with 7.4 mm barrel plug on power adapter.

WARNING: When you disconnect the power adapter cable from the laptop, grasp the connector, not the cable itself, and then pull firmly but gently to avoid damaging the cable.

WARNING: The power 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.

Kaby Lake — 7th Generation Intel Core processors

The 7th Gen Intel Core processor (Kaby Lake) family is the successor of 6th generation processors (Sky Lake). 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

Kaby lake Specifications

Table 2. Kaby lake specifications

Processor number	Clock Speed	Cache	No. of cores/No. of threads	Power	Memory type	Graphics
Intel Core i3-7100U (3M Cache, up to 2.4 GHz), Dual Core	2.4 GHz	3 MB	2/4	15 W	DDR4-2133	Intel HD graphics 620

Table 2. Kaby lake specifications (continued)

Processor number	Clock Speed	Cache	No. of cores/No. of threads	Power	Memory type	Graphics
Intel Core i5-7200U (3M Cache, up to 3.1 GHz), Dual Core	2.5 GHz	3 MB	2/4	15 W	DDR4-2133	Intel HD graphics 620
Intel Core i5-7300U (3M Cache, up to 3.5 GHz),vPro, Dual Core	2.6 GHz	3 MB	2/4	15 W	DDR4-2133	Intel HD graphics 620
Intel Core i7-7600U (4M Cache, up to 3.9 GHz), vPro, Dual Core	2.8 GHz	4 MB	2/4	15 W	DDR4-2133	Intel HD graphics 620
Intel Core i5-7300HQ (6M Cache, up to 3.5GHz), Quad Core, 35W CTDP	2.5 GHz	6 MB	4/4	35 W	DDR4-2133; DDR4-2400	Intel HD Graphics 630
Intel Core i5-7440HQ (6M Cache, up to 3.8GHz), Quad Core, 35W CTDP	2.8 GHz	6 MB	4/4	35 W	DDR4-2133; DDR4-2400	Intel HD Graphics 630
Intel Core i7-7820HQ (8M Cache up to 3.9GHz), Quad Core, 35W CTDP	2.9 GHz	8 MB	4/8	35 W	DDR4-2133; DDR4-2400	Intel HD Graphics 630

Kaby Lake Refresh — 8th Generation Intel Core processors

The 8th Gen Intel Core processor (Kaby Lake Refresh) family is the successor of 7th generation processors. Its 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

Kaby Lake Refresh Specifications

Table 3. Kaby Lake Refresh specifications

Processor number	Clock Speed	Cache	No. of cores/No. of threads	Power	Memory type	Graphics
Intel Core i7-8650U	4.2 GHz	8 MB	4/8	15 W	DDR4-2400 or LPDDR3-2133	Intel UHD graphics 620

Table 3. Kaby Lake Refresh specifications (continued)

Intel Core i7-8550U	4.0 GHz	8 MB	4/8	15 W	DDR4-2400 or LPDDR3-2133	Intel UHD graphics 620
Intel Core i5-8350U	3.6 GHz	6 MB	4/8	15 W	DDR4-2400 or LPDDR3-2133	Intel UHD graphics 620
Intel Core i5-8250U	3.4 GHz	6 MB	4/8	15 W	DDR4-2400 or LPDDR3-2133	Intel UHD graphics 620

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.

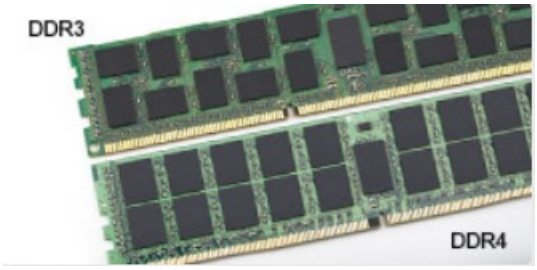


Figure 1. Notch difference

Increased thickness

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

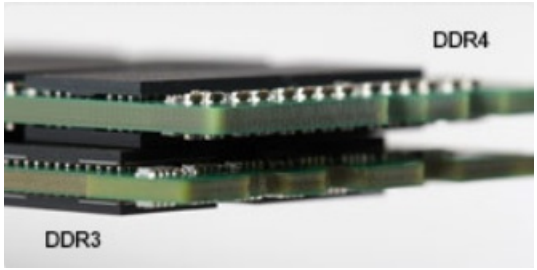


Figure 2. Thickness difference

Curved edge

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

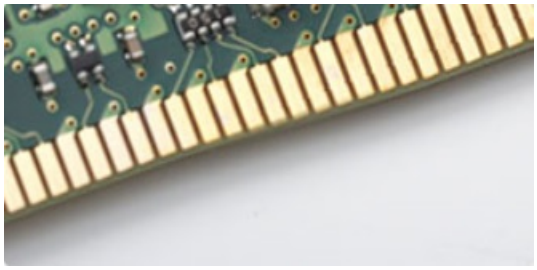


Figure 3. Curved edge

Memory Errors

Memory errors on the system display the new ON-FLASH-FLASH or ON-FLASH-ON 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.

NOTE: The DDR4 memory is imbedded in board and not a replaceable DIMM as shown and referred.

HDMI 1.4- HDMI 2.0

This topic explains the HDMI 1.4/2.0 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.

NOTE: The HDMI 1.4 will provide 5.1 channel audio support.

HDMI 1.4- 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.

Table 4. 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 Port	5 Gbps	SuperSpeed	2010
USB 3.1 Gen 2	10 Gbps	SuperSpeed	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

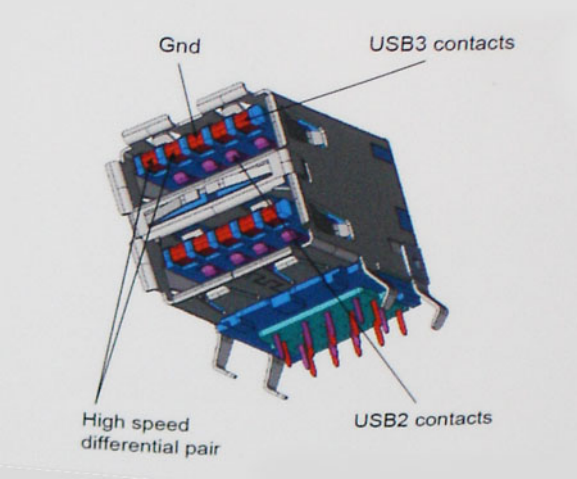
The topics below cover some of the most commonly asked questions regarding USB 3.0/USB 3.1 Gen 1.

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 4.8 Gbps. 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 480 Mbps and 12 Mbps 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 320 Mbps (40 MB/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.

Advantages of Displayport over USB Type-C

- Full DisplayPort audio/video (A/V) performance (up to 4K at 60Hz)
- SuperSpeed USB (USB 3.1) data
- Reversible plug orientation and cable direction

- Backwards compatibility to VGA, DVI with adaptors
- Supports HDMI 2.0a and is backwards compatible with previous versions

USB Type-C

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

Alternate Mode

USB Type-C is a new connector standard that's very small. It's 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 Gen2 is10Gbps . 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.

4

System specifications

Topics:

- Technical specifications

Technical specifications

System specifications

Feature	Specification
Chipset	Intel Kaby Lake (integrated with the processor)
DRAM bus width	64-bit
Flash EPROM	SPI 128 Mbits

Processor specifications

Feature	Specification
Types	• 8th Gen Intel® Core™ Processors up to i7, U Quad Core • 7th Gen Intel® Core™ Processors up to i5, U Dual Core
L3 cache	
i3 U-series	• 3 MB
i5 U-series	• 3 MB - 6 MB
i7 U-series	• 8 MB

Memory specifications

Feature	Specification
Memory connector	Two SODIMM slots
Memory capacity	4 GB, 8 GB, and 16 GB, 32 GB
Memory type	DDR4 SDRAM
Speed	2400 MHz non ECC for 8th Gen processors 2133 MHz non ECC for 7th Gen processors
Minimum memory	4 GB
Maximum memory	32 GB

Storage specifications

Feature	Specification
SSD M.2 2280 / M.S 2230 / PCIe NVMe	up to 512GB, OPAL SED options /up to 1TB, OPAL SED options /PCIe x2 NVMe
HDD	up to 1TB, Hybrid, OPAL SED options

Audio specifications

Feature	Specification
Types	High-definition audio
Controller	Realtek ALC3246
Stereo conversion	Digital audio-out through HDMI — up to 7.1 compressed and uncompressed audio
Internal interface	High-definition audio codec
External interface	Stereo headset/mic combo
Speakers	2
Internal speaker amplifier	2 W (RMS) per channel
Volume controls	Hot keys

Video specifications

Feature	Specification
Type	Integrated on system board, hardware accelerated
Graphic cards	Intel® HD Graphics 620 (Integrated in Intel 7th core processors) Intel® UHD Graphics 620 (Integrated in Intel 8th core processors) NVIDIA GeForce® MX130, 2GB GDDR5
Data bus	Integrated video
External display support	• 19-pin HDMI connector • 15-pin VGA connector • DisplayPort over USB Type-C connector

Camera specifications

Feature	Specification
Camera resolution	1 megapixels
HD Panel Resolution	1280 x 720 pixels
FHD Panel Resolution	1280 x 720 pixels

Feature	Specification
HD Panel Video Resolution (maximum)	1280 x 720 pixels
FHD Panel Video Resolution (maximum)	1280 x 720 pixels
Diagonal viewing angle	74°

Communication specifications

Features	Specification
Network adapter	10/100/1000 Mb/s Ethernet (RJ-45)
Wireless	• Internal wireless local area network (WLAN) • Internal Wireless wide area network (WWAN)

Port and connector specifications

Feature	Specification
Audio	Stereo headset / mic combo
Video	• HDMI 1.4 (UMA)/ HDMI 2.0 (Discrete) • 15 pin VGA connector
Network adapter	One RJ-45 connector
USB	Three USB 3.1 Gen 1 (one with PowerShare),
Memory card reader	SD 4.0 Memory card reader
Micro SIM (uSIM) card	external micro SIM card tray
USB Type -C Port	• One Display Port over USB Type C

Contactless smart card specifications

Feature	Specification
Supported Smart Cards/ Technologies	BTO with USH

Display specifications

Table 5. Display specification

Feature	Specification
Height	360 mm (14.17 inches)
Width	224.3 mm (8.83 inches)

Table 5. Display specification (continued)

Feature	Specification
Diagonal	396.24 mm (15.6 inches)
Actual screen size	15.6 inches
Non-touch HD anti-glare	
Maximum resolution	1920 x 1080
Maximum brightness	200 nits
Refresh rate	60 Hz
Maximum viewing angles (horizontal)	40/40
Maximum viewing angles (vertical)	+ 10/ - 30
Pixel pitch	0.252 mm (0.01 inches)
Non-touch FHD anti-glare	
Maximum resolution	1920 x 1080
Maximum brightness	220 nits
Refresh rate	60 Hz
Maximum viewing angles (horizontal)	+ 80/ - 80
Maximum viewing angles (vertical)	+ 80/ - 80
Pixel pitch	0.179 mm (0.007 inches)
Touch FHD anti-glare	
Maximum resolution	1920 x 1080
Maximum brightness	220 nits
Refresh rate	60 Hz
Maximum viewing angles (horizontal)	+ 80/ - 80
Maximum viewing angles (vertical)	+ 80/ - 80
Pixel pitch	0.179 mm (0.007 inches)

Keyboard specifications

Feature	Specification
Number of keys	• United States: 82 keys • United Kingdom: 83 keys • Japan: 86 keys • Brazil: 84 keys

Keyboard Hot Key Definitions

Some keys on your keyboard have two icons on them. These keys can be used to type alternate characters or to perform secondary functions. To type the alternate character, press Shift and the desired key. To perform secondary functions, press **Fn** and the desired key.

The following table shows the features hot key combination:

NOTE: You can define the behavior of the shortcut keys by pressing **Fn+Esc** or by changing Function Key Behavior in BIOS setup program.

Table 6. Hot key combination

Features	Function
Fn+F1	Mute audio
Fn+F2	Decrease volume
Fn+F3	Increase volume
Fn+F4	Microphone Mute
Fn+F5	NUM Lock
Fn+F6	Scroll Lock
Fn+F8	Switch to external display
Fn+F9	Search
Fn+F10 (optional)	Increase keyboard backlight brightness
Fn+F10 (optional)	Increase keyboard backlight brightness
Fn+F11	Decrease brightness
Fn+F12	Increase brightness
Fn+Esc	Toggle Fn-key lock
Fn+PrntScr	Turn off/on wireless
Fn+Insert	Sleep
Fn+Right arrow key	End
Fn+Left arrow	Home

Touchpad specifications

Feature	Specification
Active Area:	
X-axis	101.7mm
Y-axis	55.2mm

Table 7. Supported Gestures

Supported Gestures	Windows 10
Cursor moving	Supported
Clicking/ tapping	Supported
Click and drag	Supported
2-finger scroll	Supported
2-finger Pinch/ Zoom	Supported

Table 7. Supported Gestures (continued)

Supported Gestures	Windows 10
2-finger tap (Right Clicking)	Supported
3-finger tap (Invoke Cortana)	Supported
3-finger swipe up (See all open windows)	Supported
3-finger swipe down (Show the desktop)	Supported
3-finger swipe right or left (Switch between open windows)	Supported
4-finger tap (Invoke Action Center)	Supported

Battery specifications

Feature	Specification
Type	• 42 Whr • 42 Whr • 51 Whr • 68 Whr • 4 cell Long Cycle Life Battery •
Battery specifications:	42 Whr
Depth	181 mm (7.126 inches)
Height	7.05 mm (0.28 inch)
Width	95.9 mm (3.78 inches)
Weight	210 g (0.46 lb)
Voltage	11.4 V DC
Typical Amp-hour capacity	3.684Ahr
Battery specifications :	51 Whr
Depth	181 mm (7.126 inches)
Height	7.05 mm (0.28 inch)
Width	95.9 mm (3.78 inches)
Weight	250 g (0.55 lb)
Voltage	11.4 V DC
Typical Amp-hour capacity	4.473Ahr
Battery specifications :	68 WHr/4 cell Long Cycle Life Battery
Depth	233.00 mm (9.17 inches)
Height	7.5 mm (0.28 inch)
Width	95.90 mm (3.78 inches)
Weight	340 g (0.74 lb)

Feature	Specification
Voltage	7.6 V DC
Typical Amp-hour capacity	8.947Ahr
Temperature range	• Charge: 0°C to 50°C (32°F to 158°F) • Discharge: 0°C to 70°C (32°F to 122°F)
Operating	• Operating: 0°C to 35°C (32°F to 95°F)
Non-operating	- 20°C to 65°C (- 4°F to 149°F)
Coin cell battery	3 V CR2032 lithium coin cell

AC Adapter specifications

Feature	Specification
Type	65 W/90 W
Input voltage	100 V AC to 240 V AC
Input current (maximum)	1.7 A / 1.6 A
Input frequency	50 Hz to 60 Hz
Output current	3.34 A (continuous) / 4.62 A (continuous)
Rated output voltage	19.5 +/– 1.0 V DC
Temperature range (Operating)	0°C to 40°C (32°F to 104°F)
Temperature range (Non-Operating)	–40°C to 70°C (–40°F to 158°F)
Barrel size	7.4mm

Physical specifications

Feature	Specification
Front height	• Non Touch - 20.6 mm (0.8 inch) • Touch - 21.65 mm (0.8 inch)
Back height	• Non Touch - 23.25 mm (0.9 inch) • Touch - 24.3 mm(0.9 inch)
Width	• 376.0 mm (14.8 inches)
Depth	• 250.7 mm (9.9 inches)
Starting weight	• 4.14 lbs (1.88 kg)

Environmental specifications

Temperature	Specifications
Operating	0°C to 35°C (32°F to 95°F)
Storage	–40°C to 65°C (–40°F to 149°F)

Relative humidity (maximum)	Specifications
Operating	10 % to 90 % (non condensing)
Storage	5 % to 95 % (non condensing)

Altitude (maximum)	Specifications
Operating	0 m to 3048 m (0 ft to 10,000 ft)
Non-operating	0 m to 10,668 m (0 ft to 35,000 ft)
Airborne contaminant level	G1 as defined by ISA-71.04–1985

5

System setup options

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

Topics:

BIOS overview

The BIOS manages data flow between the computer's operating system and attached devices such as hard disk, video adapter, keyboard, mouse, and printer.

Entering BIOS setup program

1. Turn on your computer.
2. Press F2 immediately to enter the BIOS setup program.

   NOTE: If you wait too long and the operating system logo appears, continue to wait until you see the desktop. Then, turn off your computer and try again.

Boot Sequence

Boot sequence enables 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: XXXX denotes the SATA drive number.
- Optical Drive (if available)
- SATA Hard Drive (if available)
- Diagnostics

  NOTE: Choosing **Diagnostics**, displays the **SupportAssist** screen.

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

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.
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.
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.

One time boot menu

To enter **one time boot menu**, turn on your computer, and then press F12 immediately.

NOTE: It is recommended to shutdown the computer if it is on.

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 (if available)

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

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

System Setup overview

System Setup allows you to:

- Change the system configuration information after you add, change, or remove any hardware in your computer.
- Set or change a user-selectable option such as the user password.
- Read the current amount of memory or set the type of hard drive installed.

Before you use System Setup, it is recommended that you write down the System Setup screen information for future reference.

CAUTION: Unless you are an expert computer user, do not change the settings for this program. Certain changes can cause your computer to work incorrectly.

Accessing System Setup

1. Turn on (or restart) your computer.
2. After the white Dell logo appears, press F2 immediately.

   The System Setup page is displayed.

   NOTE: If you wait too long and the operating system logo appears, wait until you see the desktop. Then, shut down or restart your computer and try again.

   NOTE: After the Dell logo appears, you can also press F12 and then select **BIOS setup**.

General screen options

This section lists the primary hardware features of your computer.

Option	Description
System Information	This section lists the primary hardware features of your computer. ● System Information: Displays BIOS Version, Service Tag, Asset Tag, Ownership Tag, Ownership Date, Manufacture Date, and the Express Service Code. ● Memory Information: Displays Memory Installed, Memory Available, Memory Speed, Memory Channels Mode, Memory Technology, DIMM ASize, DIMM B Size, ● Processor Information: Displays Processor Type, Core Count, Processor ID, Current Clock Speed, Minimum Clock Speed, Maximum Clock Speed, Processor L2 Cache, Processor L3 Cache, HT Capable, and 64-Bit Technology. ● Device Information: Displays Primary Hard Drive, M.2 SATA2, M.2 SATA, M.2 PCIe SSD-0, LOM MAC Address, Video Controller, Video BIOS Version, Video Memory, Panel Type, Native Resolution, Audio Controller, Wi-Fi Device, WiGig Device, Cellular Device, Bluetooth Device.
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. ● Diskette Drive ● Internal HDD ● USB Storage Device ● CD/DVD/CD-RW Drive ● Onboard NIC
Advanced Boot Options	This option allows you the legacy option ROMs to load. By default, the **Enable Legacy Option ROMs** is disabled.
UEFI Booth Path Security	This options controls whether or not the system will prompt the user to enter the Admin password when booting a UEFI boot path from the F12 Boot Menu. ● Always, Except Internal HDD ● Always ● Never (by default enabled)
Date/Time	Allows you to change the date and time.

System Configuration screen options

Option	Description
Integrated NIC	Allows you to configure the integrated network controller. The options are: ● Disabled ● Enabled ● Enabled w/PXE: This option is enabled by default.
Parallel Port	Allows you to configure the parallel port on the docking station. The options are: ● Disabled ● AT: This option is enabled by default. ● PS2 ● ECP
Serial Port	Allows you to configure the integrated serial port. The options are: ● Disabled ● COM1: This option is enabled by default. ● COM2 ● COM3 ● COM4
SATA Operation	Allows you to configure the internal SATA hard-drive controller. The options are: ● Disabled ● AHCI ● RAID On: This option is enabled by default.
Drives	Allows you to configure the SATA drives on board. All drives are enabled by default. The options are: ● SATA-0 ● SATA-2 ● SATA-4 ● M.2 PCI-e SSD-0
SMART Reporting	This field controls whether hard drive errors for integrated drives are reported during system startup. This technology is part of the SMART (Self Monitoring Analysis and Reporting Technology) specification. This option is disabled by default. ● Enable SMART Reporting
USB Configuration	This is an optional feature. This field configures the integrated USB controller. If Boot Support is enabled, the system is allowed to boot any type of USB Mass Storage Devices (HDD, memory key, floppy). If USB port is enabled, device attached to this port is enabled and available for OS. If USB port is disabled, the OS cannot see any device attached to this port. The options are: ● Enable USB Boot Support (by default enable) ● Enable External USB Port (by default enable) ● Enable Thunderbolt Ports (by default enable) ● Enable Thunderbolt Boot Support ● Always Allow Dell Docks (by default enable) ● Enable Thunderbolt (ans PCIe behind TBT) Pre-boot ● Security level — No Secuirty ● Security level — User Configuration(by default enable) ● Security level — Secure connect ● Security level — Display Port Only **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.

Option	Description
Audio	This field enables or disables the integrated audio controller. By default, the **Enable Audio** option is selected. The options are: ● Enable Microphone (by default enable) ● Enable Internal Speaker (by default enable)
Keyboard Illumination	This field lets you choose the operating mode of the keyboard illumination feature. The keyboard brightness level can be set from 0% to 100%. The options are: ● Disabled ● Dim ● Bright (enabled by default)
Keyboard Backlight Timeout on AC	The Keyboard Backlight Timeout dims out with AC option. The main keyboard illumination feature is not affected. Keyboard Illumination will continue to support the various illumination levels. This field has an effect when the backlight is enabled. ● 5 seconds ● 10 seconds (enabled by default) ● 15 seconds ● 30 seconds ● 1 minute ● 5 minutes ● 15 minutes ● Never
Keyboard Backlight Timeout on Battery	The Keyboard Backlight Timeout dims out with Battery option. The main keyboard illumination feature is not affected. Keyboard Illumination will continue to support the various illumination levels. This field has an effect when the backlight is enabled. ● 5 seconds ● 10 seconds (enabled by default) ● 15 seconds ● 30 seconds ● 1 minute ● 5 minutes ● 15 minutes ● Never
Keyboard Backlight with AC	The Keyboard Backlight with AC option does not affect the main keyboard illumination feature. Keyboard Illumination will continue to support the various illumination levels. This field has an effect when the backlight is enabled.
Touchscreen	This fields controls whether the touchscreen is enabled or diabled. ● Touchscreen (enabled by default)
Unobtrusive Mode	This option, when enabled, pressing Fn+F7 turns off all light and sound emissions in the system. To resume normal operation, press Fn+F7 again. This option is disabled by default.
Miscellaneous Devices	Allows you to enable or disable the following devices: ● Enable Camera —enabled by default ● Enable Hard Drive Free Fall Protection (enabled by default) ● Enable Secure Digital (SD) Card (enabled by default) ● Secure Digital (SD) Card Boot ● Secure Digital (SD) Card Read — only Mode

Video screen options

Option	Description
LCD Brightness	Allows you to set the display brightness depending up on the power source (On Battery and On AC).

NOTE: The video setting will be visible only when a video card is installed into the system.

Security screen options

Option	Description
Admin Password	Allows you to set, change, or delete the administrator (admin) password. **NOTE:** You must set the admin password before you set the system or hard drive password. Deleting the admin password automatically deletes the system password and the hard drive password. **NOTE:** Successful password changes take effect immediately. Default setting: Not set
System Password	Allows you to set, change or delete the system password. **NOTE:** Successful password changes take effect immediately. Default setting: Not set
M.2 SATA SSD Password	Allows you to set, change, or delete the M.2 SATA SSD password. **NOTE:** Successful password changes take effect immediately. Default setting: Not set
Strong Password	Allows you to enforce the option to always set strong passwords. Default Setting: Enable Strong Password is not selected. **NOTE:** If Strong Password is enabled, Admin and System passwords must contain at least one uppercase character, one lowercase character and be at least 8 characters long.
Password Configuration	Allows you to determine the minimum and maximum length of Administrator and System passwords.
Password Bypass	Allows you to enable or disable the permission to bypass the System and the Internal HDD password, when they are set. The options are: ● Disabled ● Reboot bypass Default setting: Disabled
Password Change	Allows you to enable the disable permission to the System and Hard Drive passwords when the admin password is set. Default setting: **Allow Non-Admin Password Changes** is selected.
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.
UEFI Capsule Firmware Updates	Allows yout to control whether this system allows BIOS updates via UEFI capsule update packages. ● Enable UEFI Capsule Firmware Updates (enabled by default)
TPM 2.0 Security	Allows you to enable the Trusted Platform Module (TPM) during POST. The options are: ● TPM On (enabled by default) ● Clear ● PPI Bypass for Enabled Commands(enabled by default) ● Attestation Enable (enabled by default) ● Key Storage Enable (enabled by default) ● PPI Bypass for Disabled Commands ● SHA-256 (enabled by default) ● Disabled ● Enabled **NOTE:** To upgrade or downgrade TPM1.2/2.0, download the TPM wrapper tool (software).
Computrace	Allows you to activate or disable the optional Computrace software The options are:

Option	Description
	• Deactivate • Disable • Activate **NOTE:** The Activate and Disable options will permanently activate or disable the feature and no further changes will be allowed Default setting: Deactivate
CPU XD Support	Allows you to enable the Execute Disable mode of the processor. Enable CPU XD Support (default)
OROM Keyboard Access	Allows you to set an option to enter the Option ROM Configuration screens using hotkeys during boot. The options are: • Enable • One Time Enable • Disable Default setting: Enable
Admin Setup Lockout	Allows you to prevent users from entering Setup when an Administrator password is set. Default Setting: **Disabled**
Master Password Lockout	Allows you to disable master password support. Hard disk password need to be cleared before the setting can be changed • Enable Master Password Lockout (Disabled)

Secure Boot screen options

Option	Description
Secure Boot Enable	This option enables or disables the **Secure Boot** feature. • Disabled • Enabled Default setting: Enabled.
Secure Boot Mode	Allows you to change to Secure Boot operation mode, modifies the behavior of the Secure Boot to allow evaluation or enforcement of UEFI driver signatures. The options are: • **Deployed Mode**—Before allowing execution, checks the integrity of UEFI drivers and bootloaders. • **Audit Mode**—Performs a signature check but does not block execution of all UEFI drivers and bootloaders. Default setting: Deployed Mode
Expert Key Management	Allows you to manipulate the security key databases only if the system is in Custom Mode. The **Enable Custom Mode** option is disabled by default. The options are: • PK • KEK • db • dbx If you enable the **Custom Mode**, the relevant options for **PK, KEK, db, and dbx** appear. The options are: • **Save to File**—Saves the key to a user-selected file • **Replace from File**—Replaces the current key with a key from a user-selected file • **Append from File**—Adds a key to the current database from a user-selected file • **Delete**—Deletes the selected key • **Reset All Keys**—Resets to default setting • **Delete All Keys**—Deletes all the keys

Option	Description
	NOTE: If you disable the **Custom Mode**, all the changes that are made are erased and the keys restore to default settings.

Intel Software Guard Extensions

Option	Description
Intel SGX Enable	This fields specifies you to provide a secured environment for running code/storing sensitive information in the context of the main OS. The options are: ● Disabled ● Enabled ● Software Controlled: This option is enabled by default.
Enclave Memory Size	This option sets SGX Enclave Reserve Memory Size. The option are: ● 32 MB ● 64 MB ● 128 MB

Performance screen options

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 (By default enabled) ● 1 ● 2 ● 3
Intel SpeedStep	Allows you to enable or disable the Intel SpeedStep feature. ● Enable Intel SpeedStep Default setting: The option is enabled.
C-States Control	Allows you to enable or disable the additional processor sleep states. ● C states Default setting: The option is enabled.
Intel TurboBoost	Allows you to enable or disable the Intel TurboBoost mode of the processor. ● Enable Intel TurboBoost Default setting: The option is enabled.

Power Management screen options

Option	Description
AC Behavior	Allows you to enable or disable the computer from turning on automatically when an AC adapter is connected. Default setting: Wake on AC is not selected.
Auto On Time	Allows you to set the time at which the computer must turn on automatically. The options are: ● Disabled ● Every Day

Option	Description
	• Weekdays • Select Days Default setting: Disabled
USB Wake Support	Allows you to enable USB devices to wake the system from Standby. **NOTE:** This feature is only functional when the AC power adapter is connected. If the AC power adapter is removed during Standby, the system setup removes power from all the USB ports to conserve battery power. • Enable USB Wake Support • Wake on Dell USB-C Dock (By default enable)
Wireless Radio Control	Allows you to enable or disable the feature that automatically switches from wired or wireless networks without depending on the physical connection. • Control WLAN Radio • Control WWAN Radio Default setting: The option is disabled.
Wake on LAN/ WLAN	Allows you to enable or disable the feature that powers on the computer from the Off state when triggered by a LAN signal. • Disabled • LAN Only • WLAN Only • LAN or WLAN Default setting: Disabled
Block Sleep	This option lets you block entering to sleep (S3 state) in operating system environment. Block Sleep (S3 state) Default setting: This option is disabled
Peak Shift	This option enables you to minimize the AC power consumption during the peak power times of day. After you enable this option, your system runs only in battery even if the AC is attached.
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. Disabled Default setting: Disabled
Primary Battery Charge Configuration	Allows you to select the charging mode for the battery. The options are: • Adaptive • 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. This option is enabled by default. • 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. To enable this option, disable the **Advanced Battery Charge Configuration** option.
Sleep Mode	This option is used to select which sleep mode will be used by operating system. • OS Automatic Selection • Force S3 (By default enable)
Type-C Connector Power	This option lets you set the maximum power that can be drawn from the USB Type-C connector. • 7.5 Watts (By default enable) • 15 Watts

POST Behavior screen options

Option	Description
Adapter Warnings	Allows you to enable or disable the system setup (BIOS) warning messages when you use certain power adapters. Default setting: Enable Adapter Warnings
Keypad (Embedded)	Allows you to choose one of two methods to enable the keypad that is embedded in the internal keyboard. ● Fn Key Only: This option is enabled by default. ● By Numlock **NOTE:** When setup is running, this option has no effect. Setup works in Fn Key Only mode.
Mouse/Touchpad	Allows you to define how the system handles mouse and touch pad input. The options are: ● Serial Mouse ● PS2 Mouse ● Touchpad/PS-2 Mouse: This option is enabled by default.
Numlock Enable	Allows you to enable the Numlock option when the computer boots. Enable Network. This option is enabled by default.
Fn Key Emulation	Allows you to set the option where the Scroll Lock key is used to simulate the Fn key feature. Enable Fn Key Emulation (default)
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. The available options are: ● Fn Lock. This option is selected by default. ● Lock Mode Disable/Standard ● Lock Mode Enable/Secondary
Fastboot	Allows you to speed up the boot process by bypassing some of the compatibility steps. The options are: ● Minimal ● Thorough (default) ● Auto
Extended BIOS POST Time	Allows you to create an additional preboot delay. The options are: ● 0 seconds. This option is enabled by default. ● 5 seconds ● 10 seconds
Full Screen Logo	This option will display full screen logo if your image match screen resolution ● Enable Full Screen Logo
Warnings and Error	This option will cause the boot process to only pause when warnings or errors are detected. ● Prompt on Warnings and Errors This option is enabled by default. ● Continue on Warnings ● Continue on Warnings and Errors **NOTE:** Error deemed critical to the operation of the system hardware will always halt the system.

Virtualization support screen options

Option	Description
Virtualization	Allows you to enable or disable the Intel Virtualization Technology. Enable Intel Virtualization Technology: This option is enabled by default.

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

Wireless screen options

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/WiGig ● Bluetooth All the options are enabled by default. **NOTE:** For WLAN and WiGig enable or disable controls are tied together and they cannot be enabled or disabled independently.
Wireless Device Enable	Allows you to enable or disable the internal wireless devices. ● WWAN/GPS ● WLAN/WiGig ● Bluetooth All the options are enabled by default.

Maintenance screen options

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	This controls flashing of the system firmware to previous revisions. ● Allows BIOS Downgrade (enabled by default)
Data Wipe	This field allows users to erase the data securely from all internal storage devices. The following is list of devices affected: ● Internal SATA HDD/SSD ● Internal M.2 SATA SDD ● Internal M.2 PCIe SSD ● Internal eMMC
BIOS Recovery	This field allows you to recover from certain corrupted BIOS conditions from a recover file on the user primary hard drive or an external USB key. ● BIOS Recovery from Hard Drive (enabled by default) ● BIOS Auto-Recovery ● Always perform Integrity Check

System Log screen options

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.

Updating the BIOS

Updating the BIOS in Windows

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: https://www.dell.com/support/article/sln153694

1. Go to www.dell.com/support.
2. Click **Product support**. In the **Search support** box, enter the Service Tag of your computer, and then click **Search**.

   NOTE: If you do not have the Service Tag, use the SupportAssist feature to automatically identify your computer. You can also use the product ID or manually browse for your computer model.

3. Click **Drivers & Downloads**. Expand **Find drivers**.
4. Select the operating system installed on your computer.
5. In the **Category** drop-down list, select **BIOS**.
6. Select the latest version of BIOS, and click **Download** to download the BIOS file for your computer.
7. After the download is complete, browse the folder where you saved the BIOS update file.
8. Double-click the BIOS update file icon and follow the on-screen instructions.

   For more information, see knowledge base article 000124211 at www.dell.com/support.

Updating the BIOS in Linux and Ubuntu

To update the system BIOS on a computer that is installed with Linux or Ubuntu, see the knowledge base article 000131486 at www.dell.com/support.

Updating the BIOS using the USB drive in Windows

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: https://www.dell.com/support/article/sln153694

1. Follow the procedure from step 1 to step 6 in Updating the BIOS in Windows to download the latest BIOS setup program file.
2. Create a bootable USB drive. For more information, see the knowledge base article 000145519 at www.dell.com/support.
3. Copy the BIOS setup program file to the bootable USB drive.
4. Connect the bootable USB drive to the computer that needs the BIOS update.
5. Restart the computer and press **F12** .
6. Select the USB drive from the **One Time Boot Menu**.

7. Type the BIOS setup program filename and press **Enter**.
   The **BIOS Update Utility** appears.
8. Follow the on-screen instructions to complete the BIOS update.

Updating the BIOS from the F12 One-Time boot menu

Update your computer BIOS using the BIOS update.exe file that is copied to a FAT32 USB drive and booting from the F12 One-Time boot menu.

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: https://www.dell.com/support/article/sln153694

BIOS Update

You can run the BIOS update file from Windows using a bootable USB drive or you can also update the BIOS from the F12 One-Time boot menu on the computer.

Most of the Dell computers built after 2012 have this capability, and you can confirm by booting your computer to the F12 One-Time Boot Menu to see if BIOS FLASH UPDATE is listed as a boot option for your computer. If the option is listed, then the BIOS supports this BIOS update option.

NOTE: Only computers with BIOS Flash Update option in the F12 One-Time boot menu can use this function.

Updating from the One-Time boot menu

To update your BIOS from the F12 One-Time boot menu, you need the following:

- USB drive formatted to the FAT32 file system (key does not have to be bootable)
- BIOS executable file that you downloaded from the Dell Support website and copied to the root of the USB drive
- AC power adapter that is connected to the computer
- Functional computer battery to flash the BIOS

Perform the following steps to perform the BIOS update flash process from the F12 menu:

CAUTION: Do not turn off the computer during the BIOS update process. The computer may not boot if you turn off your computer.

1. From a turn off state, insert the USB drive where you copied the flash into a USB port of the computer.
2. Turn on the computer and press F12 to access the One-Time Boot Menu, select BIOS Update using the mouse or arrow keys then press Enter.
   The flash BIOS menu is displayed.
3. Click **Flash from file**.
4. Select external USB device.
5. Select the file and double-click the flash target file, and then click **Submit**.
6. Click **Update BIOS**. The computer restarts to flash the BIOS.
7. The computer will restart after the BIOS update is completed.

System and setup password

Table 8. System and setup password

Password type	Description
System password	Password that you must enter to log in 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 that is 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 F12 immediately after a power-on or reboot.

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.
   - At least one special character: ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [\ ] ^ _ ` { | }
   - Numbers 0 through 9.
   - Upper case letters from A to Z.
   - Lower case letters from a to z.
3. Type the system password that you entered earlier in the **Confirm new password** field and click **OK**.
4. Press Esc and save the changes as prompted by the pop-up message.
5. Press Y to save the changes.
   The computer restarts.

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 F12 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**, update, or delete the existing system password, and press Enter or Tab.
4. Select **Setup Password**, update, or delete the existing setup password, and press Enter or Tab.

   NOTE: If you change the System and/or Setup password, reenter the new password when prompted. If you delete the System and/or Setup password, confirm the deletion when prompted.
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 restarts.

Clearing CMOS settings

CAUTION: Clearing CMOS settings will reset the BIOS settings on your computer.

1. Remove the base cover.
2. Disconnect the battery cable from the system board.
3. Remove the coin-cell battery.
4. Wait for one minute.
5. Replace the coin-cell battery.
6. Connect the battery cable to the system board.

7. Replace the base cover.

Clearing BIOS (System Setup) and System passwords

To clear the system or BIOS passwords, contact Dell technical support as described at www.dell.com/contactdell.

NOTE: For information on how to reset Windows or application passwords, refer to the documentation accompanying Windows or your application.

6

Software

Topics:

Supported operating systems

The following list shows supported operating systems

Table 9. Supported operating systems

Supported operating systems	Operating System Description
Microsoft Windows	• Microsoft Windows 10 Pro (64-bit) • Microsoft Windows 10 Home (64-bit)
Other	• Ubuntu
OS Media Support	• Dell.com/support to download eligible Windows OS • USB media available for upsell

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.

Downloading the chipset driver

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 autodetect feature or manually browse for your laptop model.

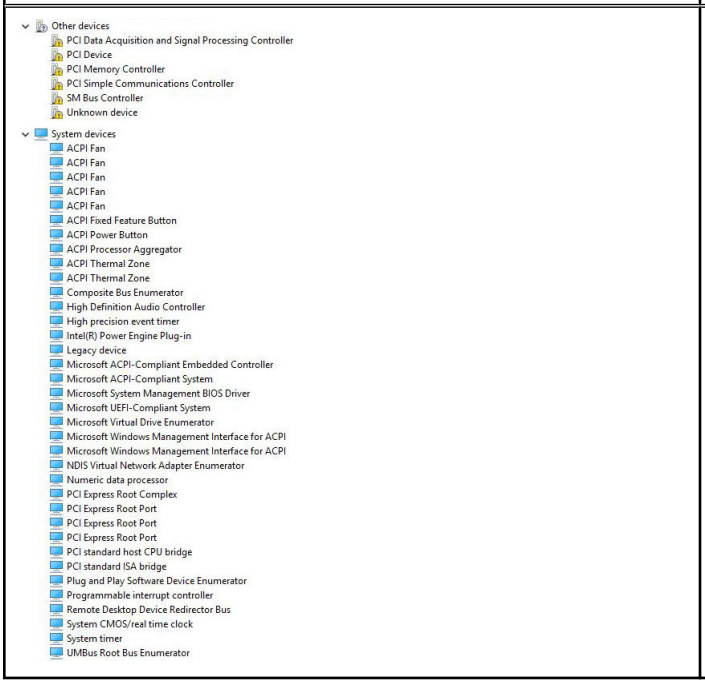
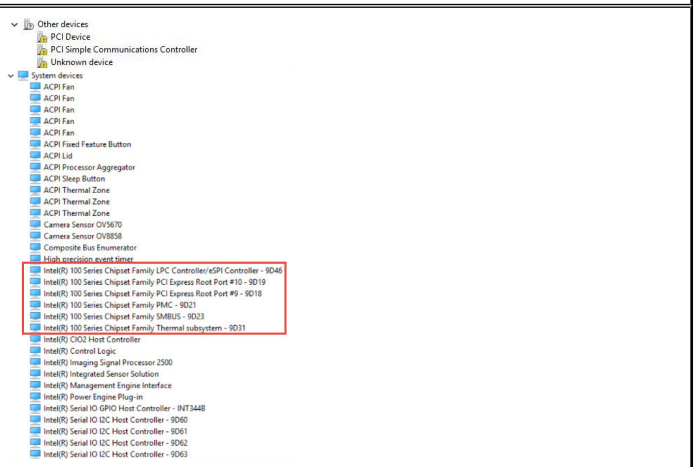
4. Click **Drivers and Downloads**.

5. Select the operating system installed on your laptop.
6. Scroll down the page, expand **Chipset**, and select your chipset driver.
7. Click **Download File** to download the latest version of the chipset driver for your laptop.
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.

Intel chipset drivers

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

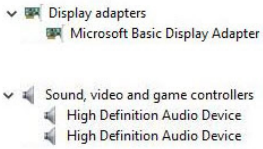
Table 10. Intel chipset drivers

Before installation	After installation
	

Intel HD Graphics drivers

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

Table 11. Intel HD Graphics drivers

Before installation	After installation
	

7

Troubleshooting

Topics:

Handling swollen Lithium-ion batteries

Like most laptops, Dell laptops use lithium-ion batteries. One type of lithium-ion battery is the lithium-ion polymer battery. Lithium-ion polymer batteries have increased in popularity in recent years and have become standard in the electronics industry due to customer preferences for a slim form factor (especially with newer ultra-thin laptops) and long battery life. Inherent to lithium-ion polymer battery technology is the potential for swelling of the battery cells.

Swollen battery may impact the performance of the laptop. To prevent possible further damage to the device enclosure or internal components leading to malfunction, discontinue the use of the laptop and discharge it by disconnecting the AC adapter and letting the battery drain.

Swollen batteries should not be used and should be replaced and disposed of properly. We recommend contacting Dell product support for options to replace a swollen battery under the terms of the applicable warranty or service contract, including options for replacement by a Dell authorized service technician.

The guidelines for handling and replacing Lithium-ion batteries are as follows:

- Exercise caution when handling Lithium-ion batteries.
- Discharge the battery before removing it from the system. To discharge the battery, unplug the AC adapter from the system and operate the system only on battery power. When the system will no longer power on when the power button is pressed, the battery is fully discharged.
- Do not crush, drop, mutilate, or penetrate the battery with foreign objects.
- Do not expose the battery to high temperatures, or disassemble battery packs and cells.
- Do not apply pressure to the surface of the battery.
- Do not bend the battery.
- Do not use tools of any type to pry on or against the battery.
- If a battery gets stuck in a device as a result of swelling, do not try to free it as puncturing, bending, or crushing a battery can be dangerous.
- Do not attempt to reassemble a damaged or swollen battery into a laptop.
- Swollen batteries that are covered under warranty should be returned to Dell in an approved shipping container (provided by Dell)—this is to comply with transportation regulations. Swollen batteries that are not covered under warranty should be disposed of at an approved recycling center. Contact Dell product support at https://www.dell.com/support for assistance and further instructions.
- Using a non-Dell or incompatible battery may increase the risk of fire or explosion. Replace the battery only with a compatible battery purchased from Dell that is designed to work with your Dell computer. Do not use a battery from other computers with your computer. Always purchase genuine batteries from https://www.dell.com or otherwise directly from Dell.

Lithium-ion batteries can swell for various reasons such as age, number of charge cycles, or exposure to high heat. For more information on how to improve the performance and lifespan of the laptop battery and to minimize the possibility of occurrence of the issue, see Dell Laptop Battery - Frequently Asked Questions.

Enhanced Pre-Boot System Assessment — 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:

The ePSA diagnostics can be initiated by the FN+PWR buttons while powering on the computer.

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

Running the ePSA Diagnostics

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

1. Power on the computer.
2. As the computer boots, press the F12 key when the Dell logo is displayed.
3. In the boot menu screen, use Up/Down arrow key to select the **Diagnostics** option and then press **Enter**.

   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.

4. Press the arrow in the lower-right corner to go to the page listing.
   The detected items are listed and tested.
5. To run a diagnostic test on a specific device, press Esc and click **Yes** to stop the diagnostic test.
6. Select the device from the left pane and click **Run Tests**.
7. If there are any issues, error codes are displayed.
   Note the error code and contact Dell.

   or
8. Shut down the computer.
9. Press and hold the Fn key, while pressing the power button, and then release both.
10. Repeat steps 3–7 above.

Built-in self-test (BIST)

M-BIST

M-BIST (Built In Self-Test) is the system board's built-in self-test diagnostics tool that improves the diagnostics accuracy of system board embedded controller (EC) failures.

NOTE: M-BIST can be manually initiated before POST (Power On Self Test).

How to run M-BIST

NOTE: M-BIST must be initiated on the system from a power-off state either connected to AC power or with battery only.

1. Press and hold both the **M** key on the keyboard and the **power button** to initiate M-BIST.

2. With both the **M** key and the **power button** held down, the battery indicator LED may exhibit two states:
   a. OFF: No fault detected with the system board
   b. AMBER: Indicates a problem with the system board
3. If there is a failure with the system board, the battery status LED will flash one of the following error codes for 30 seconds:

Table 12. LED error codes

Blinking Pattern		Possible Problem
Amber	**White**	
2	1	CPU Failure
2	8	LCD Power Rail Failure
1	1	TPM Detection Failure
2	4	Unrecoverable SPI Failure

4. If there is no failure with the system board, the LCD will cycle through the solid color screens described in the LCD-BIST section for 30 seconds and then power off.

LCD Power rail test (L-BIST)

L-BIST is an enhancement to the single LED error code diagnostics and is automatically initiated during POST. L-BIST will check the LCD power rail. If there is no power being supplied to the LCD (i.e., the L-BIST circuit fails), the battery status LED will flash either an error code [2,8] or an error code [2,7].

NOTE: If L-BIST fails, LCD-BIST cannot function as no power will be supplied to the LCD.

How to invoke L-BIST Test:

1. Press the power button to start the system.
2. If the system does not start up normally, look at the battery status LED:
   - If the battery status LED flashes an error code [2,7], the display cable may not be connected properly.
   - If the battery status LED flashes an error code [2,8], there is a failure on the LCD power rail of the system board, hence there is no power supplied to the LCD.
3. For cases, when a [2,7] error code is shown, check to see if the display cable is properly connected.
4. For cases when a [2,8] error code is shown, replace the system board.

LCD Built-in Self Test (BIST)

Dell laptops 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 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.
2. Disconnect any peripherals that are connected to the laptop. Connect only the AC adapter (charger) to the laptop.
3. Ensure 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 laptop to enter LCD built-in self test (BIST) mode. Continue to hold the D key, until the system boots up.
5. The screen will display solid colors and change colors on the entire screen to white, black, red, green, and blue twice.
6. Then it will display the colors white, black and red.
7. Carefully inspect the screen for abnormalities (any lines, fuzzy color or distortion on the screen).
8. At the end of the last solid color (red), the system will shut down.

NOTE: Dell SupportAssist Pre-boot diagnostics upon launch, initiates an LCD BIST first, expecting a user intervention confirm functionality of the LCD.

System diagnostic lights

Battery-status light

Indicates the power and battery-charge status.

Solid white—Power adapter is connected and the battery has more than 5 percent charge.

Amber—Computer is running on battery and the battery has less than 5 percent charge.

Off

- Power adapter is connected, and the battery is fully charged.
- Computer is running on battery, and the battery has more than 5 percent charge.
- Computer is in sleep state, hibernation, or turned off.

The power and battery-status light blinks amber along with beep codes indicating failures.

For example, the power and battery-status light blinks amber two times followed by a pause, and then blinks white three times followed by a pause. This 2,3 pattern continues until the computer is turned off indicating no memory or RAM is detected.

The following table shows different power and battery-status light patterns and associated problems:

Table 13. LED codes

Diagnostic light codes	Problem description
2,1	Processor failure
2,2	System board: BIOS or Read-Only Memory (ROM) failure
2,3	No memory or Random-Access Memory (RAM) detected
2,4	Memory or Random-Access Memory (RAM) failure
2,5	Invalid memory installed
2,6	System board or chipset error
2,7	Display failure
2,8	LCD power rail failure, you must replace the system board.
3,1	Coin-cell battery failure
3,2	PCI, video card/chip failure
3,3	Recovery image not found
3,4	Recovery image found, but invalid
3,5	Power rail failure
3,6	System BIOS Flash incomplete
3,7	Management Engine (ME) error

Camera status light: Indicates whether the camera is in use.

- Solid white—Camera is in use.
- Off—Camera is not in use.

Caps Lock status light: Indicates whether Caps Lock is enabled or disabled.

- Solid white—Caps Lock enabled.
- Off—Caps Lock disabled.

Recovering the operating system

When your computer is unable to boot to the operating system even after repeated attempts, it automatically starts Dell SupportAssist OS Recovery.

Dell SupportAssist OS Recovery is a standalone tool that is preinstalled in all Dell computers installed with Windows operating system. It consists of tools to diagnose and troubleshoot issues that may occur before your computer boots to the operating system. It enables you to diagnose hardware issues, repair your computer, back up your files, or restore your computer to its factory state.

You can also download it from the Dell Support website to troubleshoot and fix your computer when it fails to boot into their primary operating system due to software or hardware failures.

For more information about the Dell SupportAssist OS Recovery, see *Dell SupportAssist OS Recovery User's Guide* at www.dell.com/serviceabilitytools. Click **SupportAssist** and then, click **SupportAssist OS Recovery**.

Real Time Clock reset

The Real Time Clock (RTC) reset function allows you to recover your Dell system from **No POST/No Boot/No Power** situations. To initiate the RTC reset on the system make sure system is in a power-off state and is connected to power source . Press and hold the power button for 25 seconds and then release the power button. Go to how to reset real time clock.

NOTE: If AC power is disconnected from the system during the process or the power button is held longer than 40 seconds, the RTC reset process is aborted.

The RTC reset will reset the BIOS to Defaults, un-provision Intel vPro and reset the system date and time. The following items are unaffected by the RTC reset:

- Service Tag
- Asset Tag
- Ownership Tag
- Admin Password
- System Password
- HDD Password
- TPM on and Active
- Key Databases
- System Logs

The following items may or may not reset based on your custom BIOS setting selections:

- The Boot List
- Enable Legacy OROMs
- Secure Boot Enable
- Allow BIOS Downgrade

Backup media and recovery options

It is recommended to create a recovery drive to troubleshoot and fix problems that may occur with Windows. Dell proposes multiple options for recovering Windows operating system on your Dell PC. For more information. see Dell Windows Backup Media and Recovery Options.

WiFi power cycle

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

Drain residual flea power (perform hard reset)

Flea power is the residual static electricity that remains in the computer even after it has been powered off and the battery is removed.

For your safety, and to protect the sensitive electronic components in your computer, you are requested to drain residual flea power before removing or replacing any components in your computer.

Draining residual flea power, also known as a performing a "hard reset", is also a common troubleshooting step if your computer does not power on or boot into the operating system.

To drain residual flea power (perform a hard reset)

1. Turn off your computer.
2. Disconnect the power adapter from your computer.
3. Remove the base cover.
4. Remove the battery.
5. Press and hold the power button for 20 seconds to drain the flea power.
6. Install the battery.
7. Install the base cover.
8. Connect the power adapter to your computer.
9. Turn on your computer.

NOTE: For more information about performing a hard reset, see the knowledge base article 000130881 at www.dell.com/support.

8

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.