ThinkPad

ThinkPad T420
OMNIBUS

Note: Before using this information and the product it supports, be sure to read the general information under Appendix A “Notices” on page 83.

Edition 1.4 (March 2023)

Contents

About this manual

This manual contains service and reference information for the following ThinkPad® products.

ThinkPad T420 Machine Type 4177, 4178, 4180, 4236, 4237, and 4238

Use this manual along with the r/ThinkPad subreddit to refurbish, upgrade, and/or modify a ThinkPad T420.

Supplemental documents and resources:

- T420 User Guide
- T420 Hardware Maintenance Manual
- ThinkPad Withdrawn Book 2013 - US
- ThinkPad Withdrawn Book 2012 - Western Europe
- Drivers and Software
- r/thinkpad
- Thinkpads.com Support Community

Important:

This manual is intended as a bridge between the hardware maintenance manual and unofficial modification guides. Use this omnibus along with the hardware maintenance manual and other online resources to refurbish or upgrade a T420. Before servicing a ThinkPad product, be sure to read all the information under Chapter 1 “Safety information” on page 1 and Chapter 2 “Important service information” on page 23 of the hardware maintenance manual. This omnibus does not, for the most part, cover the actual procedure of hardware replacement or modifications, but will link to guides that do, or the hardware maintenance manual, where appropriate. This omnibus is based on the opinions and research of one individual, and does not claim to be free of errors (if you do find errors, please comment on this document *or* reach out to u/flapjack_fiasco on reddit and let me know!). FlapjackFiasco is not responsible for any damage done to your T420 by following the recommendations provided in this omnibus. You do your thing at your own risk. You know you want to.

The T420

Chapter 1. Stock Configurations

This chapter presents information about the different stock configurations available from Lenovo. There were 55 different stock configurations for the ThinkPad T420 released between February of 2011, and January of 2012 in the US from just the 2 resellers Lenovo lists in the withdrawn book. I can't find exact dates for US model releases, because unlike the Western Europe Withdrawn Book, the US Withdrawn Book has the release dates by model group instead of by individual sub-model. You can find your exact model number listed on the Main tab in your BIOS. It's a 7-digit number, starting with 41 or 42. The first four numbers are the model group number, and the last three define the specific configuration of that subgroup. The main stock configurations are as follow:

- 4177 (Between February 22, 2011, and January 17, 2012)
- 4178 (Between February 22, 2011, and May 31, 2011)
- 4178 (October 2011)
- 4178 (Optimus) (February 22, and October 11, 2011)
- 4180 (Between February 22 and May 3, 2011)
- 4180 (November 2011)
- 4180 (Optimus) (February 22, and November 1, 2011)
- 4236 (Between February 22, 2011, and January 3, 2012)
- 4236 (Optimus) (February 22, and November 1, 2011)

All US models came stock with

- Either an Intel Core i5 or i7 (some models in non-US markets did come with Intel Core i3 processors).
- 4GB of PC10600 1333MHz DDR3 non-parity, dual-channel capable 204-pin SODIMM RAM (either 4GBx1 or 2GBx2).
- Either a 7200RPM or 5400RPM HDD (320GB or 500GB), or an SSD (128GB or 160GB).
- Either a 1366x768 or 1600x900 14" TN LCD screen.
- Either a 6-cell or 9-cell battery.
- Integrated Intel HD Graphics 3000, but the Optimus models also have NVIDIA NVS 4200M discrete graphics.
- Either an Intel Centrino Wireless-N 1000 or Intel Centrino Advanced-N 6205 wireless LAN card.
- ExpressCard/34 slot, a Serial UltraBay Enhanced slot with a DVD-Burner installed, 4-in-1 multi card reader, a VGA DB-15 connector, a DisplayPort connector, UltraNav, ThinkLight, 3 USB 2.0 ports, and a USB 2.0/eSATA combo port.
- Some US models came stock with a SmartCard Reader, Bluetooth 3.0, HD720p webcam, IEEE 1394 FireWire port, modem, and/or a UPEK Fingerprint reader.

All models of T420 were discontinued in December of 2012.

Chapter 2. Enclosure Parts

This chapter presents information about the following external parts for the T420, their reference numbers on exploded view diagrams, and their corresponding FRU numbers. FRU (Field Replaceable Unit) numbers are just part numbers, but having an FRU number means the part is a wholly replaceable assembly. In some cases, this indicates that subcomponents of the FRU cannot or should not be replaced individually, but not in all cases. FRU numbers are the best way to search when looking for replacement parts, to ensure the part fits. For example, confusion between parts for the T420 and T420s can be eliminated by searching with FRU numbers instead of model numbers.

As a 10+ year-old device, you’re not likely to find a new one in the box, and used devices usually show some signs of wear, if not some serious damage or absent parts. These are very sturdy machines, but they’re not invincible. The following parts comprise the entire outside of the device, so if you have to replace a part of the enclosure, you can find its part number here. For the time being, spare parts for the T420 are plentiful, and easy to find at online retailers, such as Amazon, AliExpress, eBay, or whatever your preferred outlet is. You can easily find most individual parts, however, it is usually more affordable to buy a device that’s being sold “for-parts.” More often than not, you can get one that’s just missing the hard drive, RAM, and optical drive, but is otherwise functional. The cost of one of these is often similar to what you’ll pay after buying 3 or 4 individual replacement parts. So, if you need to replace one or two parts, it’s fine to buy them individually, but if you need to replace several, you’re better off buying a donor device.

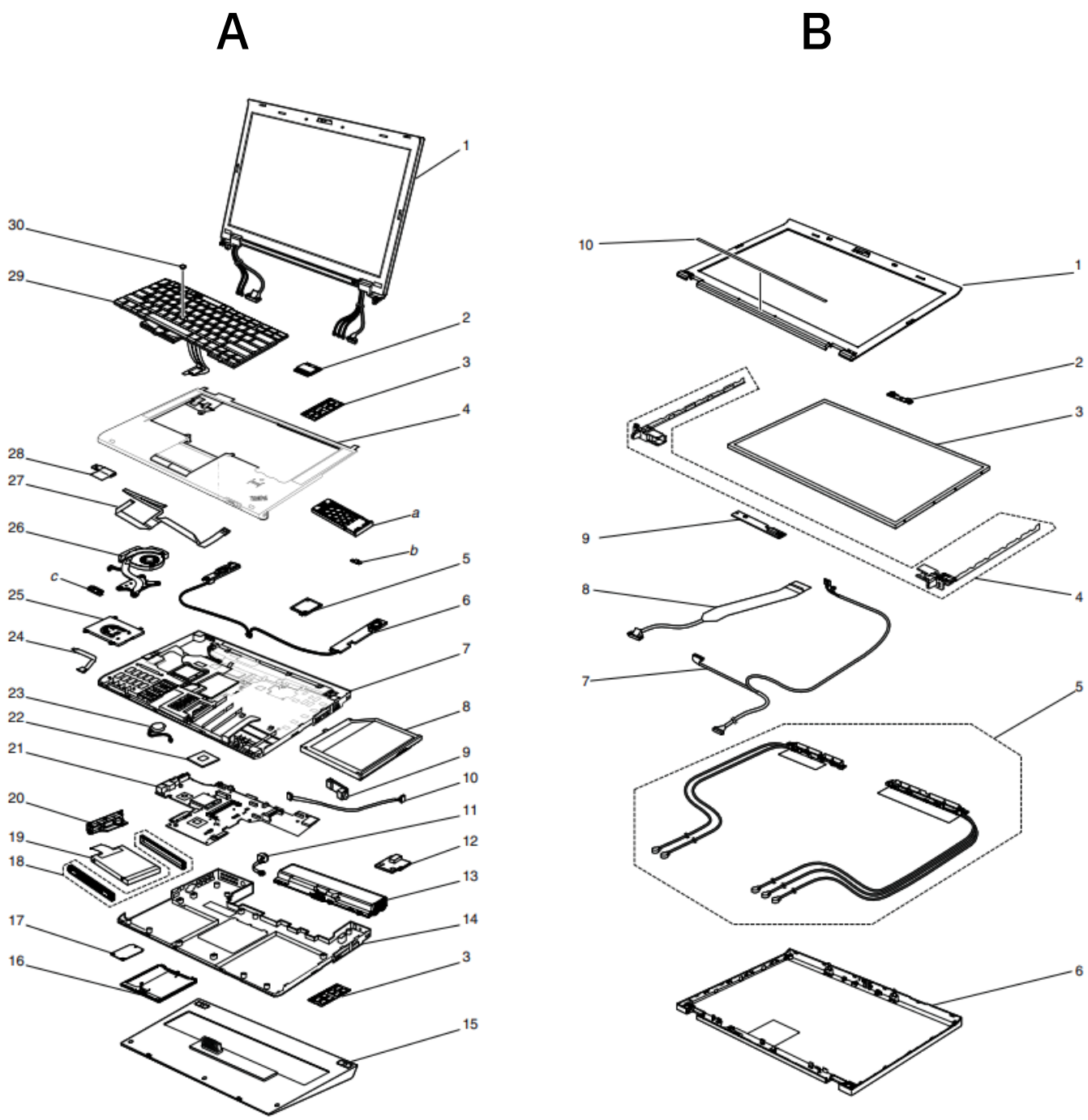


Image source: [T420 Hardware maintenance manual](), pages 134 and 155.

LCD bezel assembly (B1) FRU# 04W1609

The bezel that surrounds the LCD screen. It has cutouts for the lid latches, microphones, camera, a ThinkLight, and four rubber bumpers. The process for removing the bezel involves pulling in and up from the inside edges of the bezel, so be very careful not to damage the screen in the process. When buying this part, the following part (clear plate kit, see next entry) is usually included and attached, so note the differences before purchasing.

For procedures related to replacing the LCD bezel assembly, please refer to Chapter 8. Removing and replacing a FRU, section 2010 LCD bezel assembly, page 116, in the hardware maintenance manual.

Table 1. Parts list – LCD bezel assembly

FRU	FRU no.
LCD bezel assembly	04W1609

Clear plate kit (B10) FRU# 04W1620

The very bottom of the LCD bezel assembly has 3 holes in a row, with light pipes to direct the light from the LED indicators for WiFi, Bluetooth, and HDD activity. The Clear plate kit is a sticker that's applied to the recessed section at the bottom of the LCD bezel. It serves two purposes: First, it includes the model number of the device, because several different ThinkPad models share this same LCD bezel. Second, it has icons for WiFi, HDD activity, and optionally, Bluetooth. Models that came stock with Bluetooth will have a clear plate kit with 3 icons, models that came stock without Bluetooth will be missing the Bluetooth icon in between the WiFi and HDD activity icons.

This part is something you may want to consider if your T420 does not have Bluetooth, and you are planning to add a Bluetooth daughter card. WiFi cards that include Bluetooth functionality will not make use of the Bluetooth LED indicator, so it's not a consideration when adding Bluetooth this way.

Thanks to u/Dangerous-Snow-6982 for figuring out which part this is.

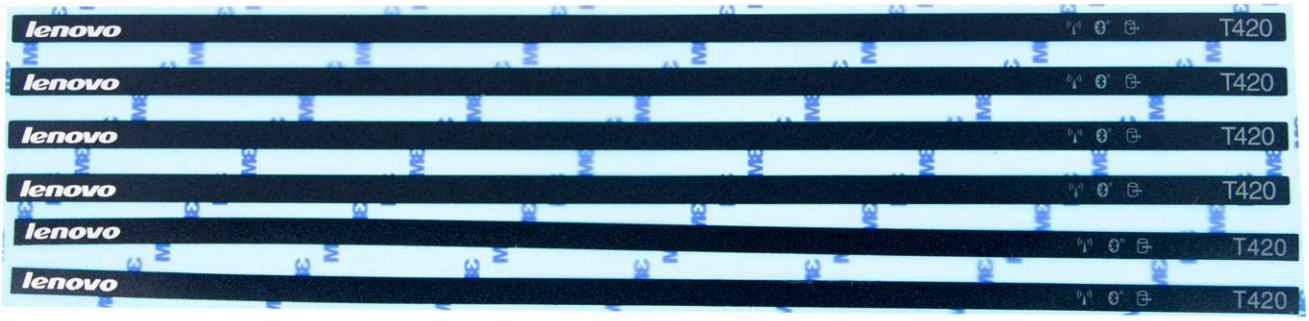


Table 3. Parts list – clear plate kit

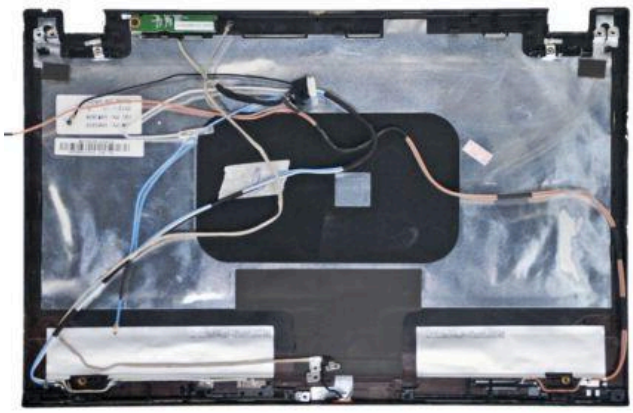
FRU	FRU no.
Clear plate kit	04W1620

There is not a procedure in the Hardware Maintenance Manual for replacing this part. That's because it's just a sticker. Carefully pick at a corner until it starts to peel up and pull at a perpendicular angle from the surface of the LCD bezel. Clean the surface with isopropyl alcohol, being sure to remove any remaining adhesive. Remove the clear plate kit from the backing sheet, align it in the recess at the bottom of the LCD bezel, and smooth it out with your fingers (or a tiny squeegee if you've got one) from the center out to each side.

LCD rear cover assembly (B6) FRU# 04W1608

The top cover. What you see on top when the device is closed. It holds the lid latches that keep the lid secured while closed. The webcam/microphone board, LED indicator board, and wireless antennas are mounted and housed here. It's got two embossed logos: Lenovo, and ThinkPad, which are recessed to be the same height as the rubberized coating. There are LED indicators covered by a clear plastic plate with charging and sleep indicator symbols. It's made of a carbon fiber and glass fiber hybrid.

You can find them for sale in various states of undress. It may or may not come with the LED indicator board, the wireless antennas, the webcam/microphone board, or even the hinges. So shop carefully based on your specific needs. A completely bare LCD rear cover assembly is often not much less than one that still has everything attached. Not having to reroute all the antennas and attach various sub-boards and hinges will significantly reduce the time needed to replace this part.



For procedures related to replacing the LCD rear cover assembly, please refer to Chapter 8. Removing and replacing a FRU, section 2070 Hinges and LCD rear cover assembly, page 126, in the hardware maintenance manual.

Table 2. Parts list – LCD rear cover assembly

FRU	FRU no.
LCD rear cover assembly	04W1608

Keyboard (A29) (See Input devices - Keyboards)

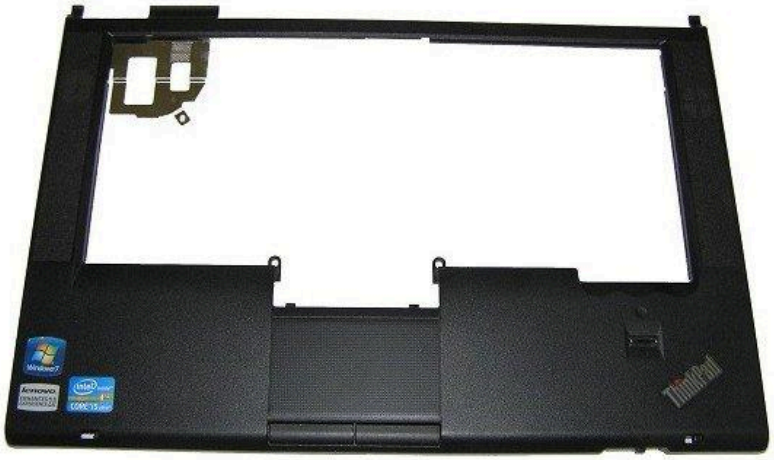
There are a lot of different keyboards for the T420. Between different regional/language layouts, and 3 different manufacturers, there are 111 different FRUs. The keyboard incorporates a TrackPoint pointing stick, and the 3 associated buttons, as well as the power button, volume buttons, ThinkVantage button, and volume and microphone mute buttons. It attaches to the system board through a single connector. It's held in place by a single screw, accessed by removing the DIMM slot cover. Refer to the Keyboards section under Chapter 9. Input devices on page 30 for more detailed information and a full list of available models and manufacturers.

For procedures related to replacing the keyboard, please refer to Chapter 8. Removing and replacing a FRU, section 1080 Keyboard, page 77, in the hardware maintenance manual.

Keyboard bezel assembly (A4) FRU# 04W1371, 04W1372

This bezel surrounds the keyboard and acts as the palmrest. There are two different versions: one with the fingerprint reader, and one without. Both versions usually include the trackpad and trackpad buttons, but not always.

Be cautious when purchasing the Keyboard bezel assembly if your intention is to add the fingerprint reader. You can find the Keyboard bezel assembly with fingerprint reader (FRU# 04W1371) for sale with and without the fingerprint reader attached to it. You can also buy the fingerprint reader without the bezel assembly, and if you don't already have the bezel that has a cut-out for the fingerprint reader, it obviously won't fit.



For procedures related to replacing the keyboard bezel assembly, please refer to Chapter 8. Removing and replacing a FRU, section 1120 Keyboard bezel assembly, FPC cable, and Bluetooth daughter card, page 87, in the hardware maintenance manual.

Table 4. Parts list – keyboard bezel assembly

FRU	FRU no.
Keyboard bezel assembly with fingerprint reader	04W1371
Keyboard bezel assembly without fingerprint reader	04W1372

Base cover assembly (A14) FRU# 04W1626

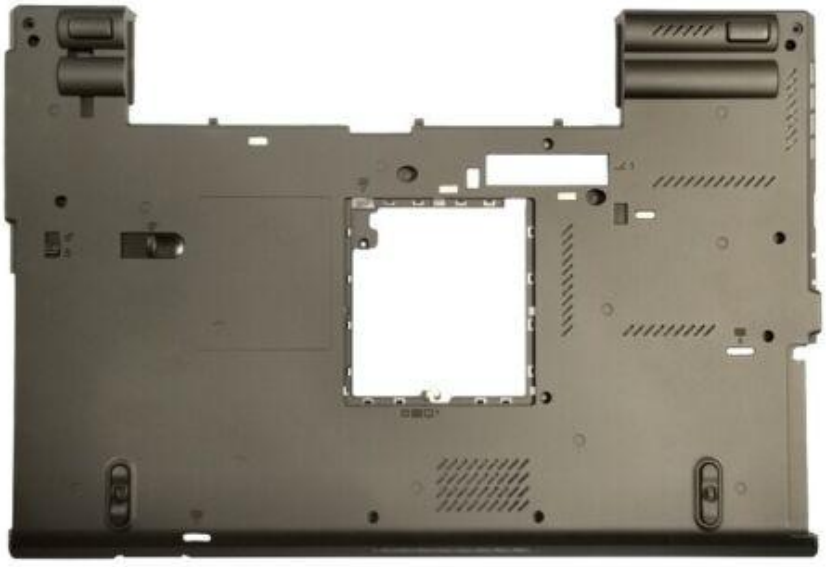
This is the bottom of the laptop. Note that for the Taiwan regional model, there were two different base cover assemblies: one for the 90W model and one for the 65W model. I have no idea why.

The base cover assembly is where most of the labeling resides. Check pages 108 and 109 of the Hardware Maintenance Manual for a list of the 22 potential identification and regulatory stickers your T420 may have.

For procedures related to replacing the base cover assembly, please refer to Chapter 8. Removing and replacing a FRU, section 1190 Base cover assembly and DC-in connector cable, page 106, in the hardware maintenance manual.

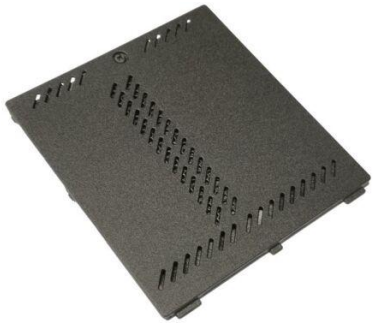
Table 5. Parts list – base cover assembly

FRU	FRU no.
Base cover assembly	04W1626
Base cover assembly (Taiwan 65 W)	04W1628
Base cover assembly (Taiwan 90 W)	04W1627



DIMM slot door (A16) FRU# 04W1636

This is the door that covers the opening for the DIMM slot that's on the underside of the device and also the mSATA slot for the wireless WAN card. It is held in place by a single screw. When removing the DIMM slot door, take a moment to appreciate the black mylar film covering the vents, which act as one-way valves for air flow.



For procedures related to replacing the DIMM slot cover, please refer to Chapter 8. Removing and replacing a FRU, section 1050 DIMM slot cover, page 73, in the hardware maintenance manual.

Table 6. Parts list – DIMM slot door

FRU	FRU no.
DIMM slot door	04W1636

HDD cover (A20) FRU# 04W1637

This is the door that covers the HDD bay. This piece is frequently missing on used models. It's also the piece that contains the slot for your SmartCard reader if your model came equipped with one. The FRU# for the HDD cover is for both variations, the one with the slot and the one without. The version with the SmartCard reader is a little bit harder to find than the one without it. It is held in place by a single screw and a plastic tab.

For procedures related to replacing the HDD cover, please refer to Chapter 8. Removing and replacing a FRU, section 1040 Hard disk drive (HDD) and solid state drive (SSD), page 70, in the hardware maintenance manual.

For printable versions, see Chapter 19. Printable Parts, under HDD Cover, page 84 of this book.

Table 7. Parts list – HDD cover

FRU	FRU no.
HDD cover	04W1637

Travel bezel (A8) FRU# 60Y5512

This is a dummy card for the UltraBay slot. Maybe more useful than an optical disc drive these days, as it reduces the overall weight of the device compared to one equipped with an optical drive.

For procedures related to replacing the travel bezel, please refer to Chapter 8. Removing and replacing a FRU, section 1030 Serial Ultrabay Enhanced device or travel bezel, page 69, in the hardware maintenance manual.04W1604

For printable versions, see Chapter 19. Printable Parts, under UltraBay Slot, page 84 of this book.

Table 8. Parts list – travel bezel

FRU	FRU no.
Travel Bezel	60Y5512

Express dummy card (Aa) FRU# 04W1604

This is a dummy card that fills the express card slot when it's not in use by another card. Can be used as a drawer for very small items that aren't too small to fall through the holes. Not intended for storing bees.

For procedures related to replacing the Express dummy card, please refer to Chapter 8. Removing and replacing a FRU, section 1020 ExpressCard blank bezel, page 68, in the hardware maintenance manual.

For a printable version, see Chapter 19. Printable Parts, under ExpressCard Slot, page 85 of this book.

Table 9. Parts list – express dummy card

FRU	FRU no.
System miscellaneous parts: • (a) Express dummy card • (b) LCD connector bracket • (c) Fan bracket, discrete • CPU mylar for 35W SV GT2 • 1394 cover • Dummy cover, RJ-11 • Plastic support for smart card • Blind sheet for SIM card • SIM dummy card Note: Italicized letters in parentheses are references to the exploded view in "Overall" on page 134 of the hardware maintenance manual.	

Chapter 3. System boards

There are two main types of system boards: those with integrated graphics and those with discrete graphics. Each of those two system boards is available in four flavors: with AMT and TPM, with AMT but no TPM, with TPM but no AMT, and with neither AMT nor TPM.

AMT (Active Management Technology) is a system for out of band maintenance. Usually used for corporate/enterprise hardware maintenance, it allows an administrator to patch/upgrade the system, without the system even being on. Useless for most consumer users.

TPM (Trusted Platform Module) is a chip that has various uses, but they're all related to DRM (Digital Rights Management). TPM requirements for Windows 11 can be bypassed (and this chip probably isn't TPM 2.0 anyway), so it's not necessary for most consumer users.

I don't think either of these are strictly necessary for the average person, and in fact, the AMT may be a security risk. CoreBoot can mitigate this risk by disabling the underlying Intel ME (Management Engine). I wouldn't let either of these "features" stop me from buying a particular system board, but I'd probably choose a non-AMT, non-TPM board if given the option.

For procedures related to replacing the system board, please refer to Chapter 8. Removing and replacing a FRU, section 1210 System board and ExpressCard slot assembly, page 112, in the hardware maintenance manual.

Table 10. Parts list – system board

FRU	FRU no.
System board assembly, integrated graphics, AMT, TPM	04W2045

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, integrated graphics, AMT, non-TPM	04W2046

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, integrated graphics, non-AMT, TPM	04Q2047

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, integrated graphics, non-AMT, non-TPM	04W2048

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, discrete graphics, AMT, TPM	04W2049

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, discrete graphics, AMT, non-TPM	04W2050

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, discrete graphics, non-AMT, TPM	04W2051

Table 10. Parts list – system board (continued)

FRU	FRU no.
System board assembly, discrete graphics, non-AMT, non-TPM	04W2052

Chapter 4. CPU

For procedures related to CPU maintenance, please refer to Chapter 8. Removing and replacing a FRU, section 1180 CPU, page 105, in the hardware maintenance manual.

Sandy-Bridge

Without altering the BIOS, the T420 supports a range of Intel Sandy-Bridge Core i3, i5, and i7 mobile processors (and also, technically, some Pentium and Celeron processors, but unless you're trying to go for a battery life record and don't care about performance, stick with Core i5 and up). The T420 uses a socketed processor, so it can be upgraded or replaced. This is rarely an option these days, because most devices use embedded CPUs, which are soldered to the mainboard. Take a look at the tables below, you'll find a list of all supported Core i3, i5, and i7 processors. I've omitted the 55w CPUs, because everything I've read suggests that they run a little too hot for the T420 to properly manage. You'll end up not getting to use any of that extra clock-rate because of throttling, due to high temperatures. Not counting the 55w CPUs, there are 8 different quad-core i7s available, from 2 to 2.5 GHz, all running at 45w. You're going to see a hit to battery life compared to the 35w CPU you're likely using now, but you'll get a decent performance increase for your trouble.

Note:

Units marked in purple were available as stock CPUs on US T420 models.

Table 11. Parts list – Sandy-Bridge CPUs

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Core i7	2860QM	4 (8)	2.5 GHz	3.6/3.5/3.3 GHz	650 MHz	1300 MHz	8 MB	45W
	2820QM		2.3 GHz	3.4/3.3/3.1 GHz				
	2760QM		2.4 GHz	3.5/3.4/3.2 GHz			6 MB	
	2720QM		2.2 GHz	3.3/3.2/3.0 GHz				
	2675QM		2.2 GHz	3.1/3.0/2.8 GHz		1200 MHz		
	2670QM					1100 MHz		
	2635QM		2.0 GHz	2.9/2.8/2.6 GHz		1200 MHz		
	2630QM					1100 MHz		
	2640M	2 (4)	2.8 GHz	3.5/3.3 GHz		1300 MHz	4 MB	35W
	2620M		2.7 GHz	3.4/3.2 GHz				
	2649M		2.3 GHz	3.2/2.9 GHz	500 MHz	1100 MHz		25W
	2629M		2.1 GHz	3.0/2.7 GHz				
	2677M		1.8 GHz	2.9/2.6 GHz	350 MHz	1200 MHz		17W
	2637M		1.7 GHz	2.8/2.5 GHz				
	2657M		1.6 GHz	2.7/2.4 GHz		1000 MHz		
	2617M		1.5 GHz	2.6/2.3 GHz		950 MHz		

Table 11. Parts list – Sandy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Core i5	2557M	2 (4)	1.7 GHz	2.7/2.4 GHz	350 MHz	1200 MHz	3 MB	17W

	2537M		1.4 GHz	2.3/2.0 GHz		900 MHz			
	2467M		1.6 GHz	2.3/2.0 GHz		1150 MHz			
	2540M		2.6 GHz	3.3/3.1 GHz		1300 MHz			
	2520M		2.5 GHz	3.2/3.0 GHz					
	2450M			3.1/2.8 GHz	650 MHz	1300 MHz			35W
	2435M		2.4 GHz	3.0/2.7 GHz					
	2430M					1200 MHz			
	2410M		2.3 GHz	2.9/2.6 GHz					

Table 11. Parts list – Sandy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Core i3	2370M	2 (4)	2.4 GHz	–	650 MHz	1150 MHz	3 MB	35W
	2350M		2.3 GHz					
	2348M							

	2330M		2.2 GHz			1100 MHz		
	2328M							
	2312M		2.1 GHz					
	3210M					1100 MHz		
	2377M		1.5 GHz		350 MHz	1000 MHz		17W
	2375M							
	2367M		1.4 GHz					
	2365M							
	2357M		1.3 GHz			950 MHz		

Table 11. Parts list – Sandy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Pentium	B915C	2 (4)	1.5 GHz	–	–		3 MB	15W
	997	2 (2)	1.6 GHz		350 MHz	1000 MHz	2 MB	17W
	987		1.5 GHz					
	977		1.4 GHz					
	967		1.3 GHz					
	957		1.2 GHz			800 MHz		

	B980		2.4 GHz		650 MHz	1150 MHz		35W
	B970		2.3 GHz					
	B960		2.2 GHz			1100 MHz		
	B950		2.1 GHz					
	B940		2.0 GHz					

Table 11. Parts list – Sandy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Celeron	B840	2 (2)	1.9 GHz	—	650 MHz	1000 MHz	2 MB	35W
	B830		1.8 GHz			1050 MHz		
	B820		1.7 GHz					
	B815		1.6 GHz					
	B810E					1000 MHz		

	B810					950 MHz		
	B800		1.5 GHz			1000 MHz		
	887				350 MHz			17W
	877		1.4 GHz					
	867		1.3 GHz					
	857		1.2 GHz					
	847		1.1 GHz			800 MHz		
	847E							
	807	1 (2)	1.5 GHz			950 MHz		
	725C		1.3 GHz		—			10W
	827E	1 (1)	1.4 GHz		350 MHz	800 MHz	1.5MB	17W
	797					950 MHz		
	787		1.3 GHz					
	B730		1.8 GHz		650 MHz	1000 MHz		35W
	B720		1.7 GHz					
	B710		1.6 GHz					
	807UE		1.0 GHz		350 MHz	800 MHz	1 MB	10W

Source: en.wikipedia.org - List of Sandy-Bridge mobile CPUs.

Ivy-Bridge

Installing CoreBoot will allow you to replace your CPU with a newer, 3rd generation Intel Ivy-Bridge processor. These processors offer a modest performance improvement. A little better clock speed, or a little better efficiency, but the real payoff is in the integrated graphics. Ivy-Bridge processors have Intel HD 4000 graphics as opposed to the HD 3000 in Sandy-Bridge CPUs. Depending on the application, the Intel HD 4000 provides about 40% better performance than HD 3000. I don't think anyone would ever seriously classify the T420 as a gaming laptop, but an Ivy-Bridge upgrade can mean the difference between being able to play a game at 30 fps, and not being able to play it at all. Check out some of the benchmarks at the following link to see a comparative example of the difference between these two generations of integrated graphics: Intel HD Graphics 4000 vs Intel HD Graphics 3000.

Important:
Installing CoreBoot is an advanced and involved process, including almost complete disassembly of the device, and flashing ICs on the system board. It requires additional hardware in order to accomplish, and is not recommended until thorough study of the process and the possible consequences has been undertaken. This process has the potential to brick your device if you don't pay attention to what you're doing. FlapjackFiasco is not responsible for any damage done to your device by attempting to install CoreBoot.

Table 12. Parts list – Ivy-Bridge CPUs

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Core i7	3840QM	4 (8)	2.8 GHz	3.8 GHz	650 MHz	1300 MHz	8 MB	45W
	3820QM		2.7 GHz	3.7 GHz		1250 MHz		
	3740QM					1300 MHz	6 MB	
	3720QM		2.6 GHz	3.6 GHz		1250 MHz		
	3635QM		2.4 GHz	3.4 GHz		1200 MHz		
	3632QM		2.2 GHz	3.2 GHz		1150 MHz		35W
	3630QM		2.4 GHz	3.4 GHz				45W
	3615QM		2.3 GHz	3.3 GHz		1200 MHz		
	3612QM		2.1 GHz	3.1 GHz		1100 MHz		35W
	3610QM		2.3 GHz	3.3 GHz				45W
	3689Y	2 (4)	1.5 GHz	2.6 GHz	350 MHz	850 MHz	4 MB	13W
	3687U		2.1 GHz	3.3 GHz		1200 MHz		17W
	3667U		2.0 GHz	3.2 GHz		1150 MHz		
	3537U			3.1 GHz		1200 MHz		
	3555LE		2.5 GHz	3.2 GHz	550 MHz	1000 MHz		25W
	3540M		3.0 GHz	3.7 GHz	650 MHz	1300 MHz		35W
	3525M		2.9 GHz	3.6 GHz		1350 MHz		
	3520M					1250 MHz		
	3517U		1.9 GHz	3.0 GHz	350 MHz	1150 MHz		17W
	3517UE		1.7 GHz	2.8 GHz		1000 MHz		

Table 12. Parts list – Ivy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Core i5	3610ME	2 (4)	2.7 GHz	3.3 GHz	650 MHz	950 MHz	3 MB	35W
	3439Y		1.5 GHz	2.3 GHz	350 MHz	850 MHz		13W
	3437U		1.9 GHz	2.9 GHz	650 MHz	1200 MHz		17W
	3427U		1.8 GHz	2.8 GHz	350 MHz	1150 MHz		
	3380M		2.9 GHz	3.6 GHz	650 MHz	1250 MHz		35W
	3365M		2.8 GHz	3.5 GHz		1350 MHz		
	3360M					1200 MHz		
	3340M		2.7 GHz	3.4 GHz		1250 MHz		
	3339Y		1.5 GHz	2.0 GHz	350 MHz	850 MHz		13W
	3337U		1.8 GHz	2.7 GHz		1100 MHz		17W
	3320M		2.6 GHz	3.3 GHz	650 MHz	1200 MHz		35W
	3317U		1.7 GHz	2.6 GHz	350 MHz	1050 MHz		17W
	3230M		2.6 GHz	3.2 GHz	650 MHz	1100 MHz		35W
	3210M		2.5 GHz	3.1 GHz				

Table 12. Parts list – Ivy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Core i3	3229Y	2 (4)	1.4 GHz	—	350 MHz	850 MHz	3 MB	13W
	3227U		1.9 GHz			1100 MHz		17W
	3217U		1.8 GHz			1050 MHz		
	3217UE		1.6 Ghz			900 MHz		
	3130M		2.6 GHz		650 MHz	1100 MHz		35W
	3120M		2.5 GHz					
	3120ME		2.4 GHz			900 MHz		
	3110M					1000 MHz		
	3115C		2.5 GHz		—		4 MB	25W

Table 12. Parts list – Ivy-Bridge CPUs (continued)

Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Pentium	B925C	2 (4)	2.0 GHz	—	—		4 MB	15W
	A1018	2 (2)	2.1 GHz		650 MHz	1000 MHz	1 MB	35W
	2030M		2.5 GHz			1100 MHz	2 MB	
	2020M		2.4 GHz					
	2127U		1.9 GHz		350 MHz			17W
	2117U		1.8 GHz			1000 MHz		
	2129Y		1.1 GHz			850 MHz		10W

Table 12. Parts list – Ivy-Bridge CPUs (continued)

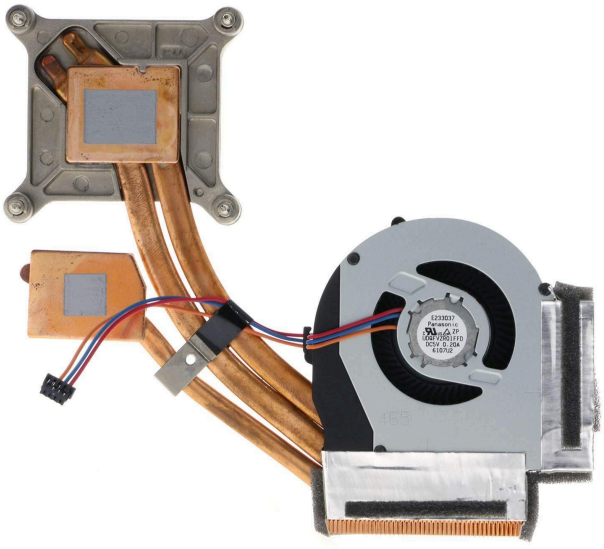
Processor branding and model		Cores / threads	CPU clock rate		Graphics clock rate		L3 cache	TDP
			Normal	Turbo	Normal	Turbo		
Celeron	1019Y	2 (2)	1.0 GHz	—	350 MHz	800 MHz	2 MB	10W
	1020E		2.2 GHz		650 MHz	1000 MHz		35W
	1020M		2.1 GHz					
	1005M		1.9 GHz					
	1000M		1.8 GHz					
	1037U				350 MHz			17W
	1017U		1.6 GHz					
	1007U		1.5 GHz					
	1047UE		1.4 GHz			900 MHz		
	927UE	1 (1)	1.5 GHz				1 MB	

Source: en.wikipedia.org - List of Ivy-Bridge mobile CPUs.

Chapter 5. Fan assembly

The fan assembly is a system of heatsinks, heat piping, and a fan that cools the CPU and GPU. There are two different fan assemblies, referred to as fan assembly, integrated; and fan assembly, discrete. One is for system boards with integrated graphics, and the other is for system boards with discrete graphics. If you don't have discrete graphics, but would like to, along with replacing your system board, you'll also have to replace your fan assembly, integrated; with a fan assembly, discrete. Consensus seems to be that integrated graphics are just as capable as discrete graphics, and that this upgrade is probably not worth the effort, time or money. The best way to improve graphics would be either an eGPU through an ExpressCard adapter, or the improved integrated graphics on an Ivy-Bridge CPU.

Because of the discrete fan assembly's extra copper mass, it will cool better than the integrated fan assembly even if you don't have a system board with discrete graphics.



For procedures related to replacing the fan assembly, please refer to Chapter 8. Removing and replacing a FRU, section 1170 Fan assembly, page 101, in the hardware maintenance manual.

Fan assembly, integrated

Table 13. Parts list – fan assembly, integrated

FRU	FRU no.
Fan assembly, integrated	04W0407 04W0409

Fan assembly, discrete

Table 14. Parts list – fan assembly, discrete

FRU	FRU no.
Fan assembly, discrete	04W0408 04W0410

Chapter 6. GPU

The only way to upgrade your GPU, without replacing your system board, is to upgrade your CPU. If there's a better CPU available for your device, it likely has better integrated graphics. If you don't have a discrete GPU, the only way to get one is to replace your system board and heatsink/fan assembly with one that has a discrete GPU.

There is one more, external option. There is an adaptor that lets you connect a PCIe desktop graphics card through the ExpressCard port. This is the highest performing option, but at a cost of portability and battery life.

For more information about the system board, see Chapter 2. System boards.

For more information about the fan assembly, see Chapter 4. Fan assembly.

For procedures related to replacing the system board, please refer to Chapter 8. Removing and replacing a FRU, section 1170 Fan assembly, page 101, in the hardware maintenance manual.

For procedures related to replacing the system board, please refer to Chapter 8. Removing and replacing a FRU, section 1210 System board and ExpressCard slot assembly, page 112, in the hardware maintenance manual.

Chapter 7. RAM

The ThinkPad T420 uses PC3 SODIMM RAM, in two slots, one located on the underside of the system board, accessible through the DIMM slot door, and the other, located on the topside of the system board, underneath the keyboard. RAM is best purchased in pairs, because both DIMMs are tested together for stability and functionality.

For procedures related to replacing the RAM, please refer to Chapter 8. Removing and replacing a FRU, section 1060 DIMM (in the slot on the underside of the computer), page 74, and 1090 DIMM (in the slot under the keyboard), page 81, in the hardware maintenance manual.

Capacity

With a fully updated stock Lenovo BIOS, you can have a maximum of 16GB (2 x 8GB DIMMs). This is the same for a modified BIOS, or CoreBoot. You can, of course, have less than 16GB. Common configurations include 8GB (2 x 4GB DIMMs), and 4GB (2 x 2GB DIMMs). If you plan on running modern Windows, or using Chrome on any OS, 8GB of RAM is recommended at a minimum. If you have less than 8GB of RAM, and plan on upgrading, be sure to compare the price between 8GB and 16GB. You may be surprised by how little difference there is in price.

Speed

With a fully updated stock BIOS, the fastest supported memory speed is 1333MHz. There are earlier versions of the stock BIOS that allowed RAM at speeds of 1600MHz and 1866MHz, but that feature has been rolled back. A modified BIOS allows for RAM at speeds of 1600MHz and 1866MHz. CoreBoot allows for RAM at speeds up to 2133MHz.

Chapter 8. Disk Drives

There are 4 possible locations for hard disk drives in the T420. There's the main HDD bay, which accommodates 2.5" HDD or SSD, the WWAN slot, which can accept a mSATA drive, and finally, there's an UltraBay adapter that has a HDD caddy for another 2.5" drive. Finally, there's an aftermarket adapter for the ExpressCard slot that allows for an NVMe drive.

Hard disk drives

Any 2.5" SATA III hard disk drive will work.

For procedures related to replacing the hard disk drive, please refer to Chapter 8. Removing and replacing a FRU, section 1040 Hard disk drive (HDD) and solid state drive (SSD), page 70, in the hardware maintenance manual.

Solid state drives

Any 2.5” SATA III solid state drive will work. There are a few considerations when looking for an appropriate solid state drive. This applies to any solid state drive you may consider for your T420, either 2.5” or mSATA. You can find solid state drives with and without DRAM cache. Having DRAM cache on your solid state drive will give you a small boost for small file reads, on the order of 10Mb/s generally speaking. On the other hand, large file reads benefit more significantly from having an onboard DRAM cache. Both small and large file writes are impacted by having DRAM cache. So, if you don’t often work with large files, and aren’t constantly generating new files, you likely won’t notice the difference. Your wallet definitely will though, as SSDs with DRAM cache can cost 2, 3, and 4 times as much as the alternative, depending on the size and brand of the drive. Also, consider only looking for new/unused drives. It’s impossible to determine how worn out a solid state drive is from visual examination, so used drives should be avoided unless sudden failure is acceptable.

For procedures related to replacing the hard disk drive, please refer to Chapter 8. Removing and replacing a FRU, section 1040 Hard disk drive (HDD) and solid state drive (SSD), page 70, in the hardware maintenance manual.

mSATA drives

For the WWAN slot and the UltraBay adapter, you need a mSATA (miniSATA) SSD. Note that while the HDD bay and UltraBay can make use of SATA III speeds, the mSATA slot is limited to SATA II speeds. A SATA III drive will still work, but it will operate at SATA II speeds. The WWAN connector is a mini PCIe slot that’s connected to the SATA bus, essentially a combo slot. It’s got USB signal lines, and mSATA connections, so it works with either mini PCIe cards that use USB signaling, or mSATA disk drives.

Shopping Considerations

As a standard, mSATA didn’t exist for very long, with new standards like M.2 quickly replacing it. For that reason, mSATA drives may be more difficult to source than an equivalent 2.5” solid state drive, and is likely to cost more for the same capacity drive.

For procedures related to installing a mSATA drive, please refer to Chapter 8. Removing and replacing a FRU, section 1070 PCI Express Mini Card for wireless WAN, page 75, in the hardware maintenance manual.

Chapter 9. Battery and Charging

The T420 had three versions of the main battery: a 4-cell (55), a 6-cell (55+), and a 9-cell (55++), although I've never seen a 4-cell in the wild, and I don't think that it was a stock option. Lenovo later revised and re-released the 55 series batteries as the 70 series (70+ and 70++). From what I can gather, there are two main differences. The 70 series batteries have an authentication chip, required by the XX30 ThinkPad series. The 55 series batteries will not work with newer ThinkPads that use the same form factor battery because they lack this authentication chip. Also, I believe the 70 series supports a faster charging protocol (need confirmation on this).

Additionally, there is a Slice battery, which attaches to the underside of the device, through the same connector used for the dock.

There is also a CMOS/Clock backup battery located underneath the keyboard.

For procedures related to replacing the battery pack, please refer to Chapter 8. Removing and replacing a FRU, section 1010 Battery pack, page 67, in the hardware maintenance manual.

For procedures related to replacing the backup battery, please refer to Chapter 8. Removing and replacing a FRU, section 1100 Backup battery, page 83, in the hardware maintenance manual.

4-cell battery

Table 15. Parts list – 4-cell battery

FRU	FRU no.
Battery pack, Li-ion (4-cell) 55	42T4883 42T4885

6-cell battery

Table 16. Parts list – 6-cell battery

FRU	FRU no.
Battery pack, Li-ion (6-cell) 55+	42T4791 42T4793 42T4795 42T4911

Table 16. Parts list – 6-cell battery (continued)

Battery pack, Li-ion (6-cell) 26+	42T4817 42T4819

9-cell battery

Table 17. Parts list – 9-cell battery

FRU	FRU no.
Battery pack, Li-ion (9-cell) 55++	42T4799 42T4801 42T4912

Slice battery

Table 18. Parts list – slice battery

FRU	FRU no.
Slice battery, Li-ion (9-cell) 27++	42T4739

Backup battery

Table 19. Parts list – backup battery

FRU	FRU no.
Backup battery	02K7078 04W1642

Chapter 10. Input Devices

ThinkPads are well known for having TrackPoint pointing stick input devices. Earlier models are known for having excellent keyboards. The T420 is one of these, boasting a full 7 row keyboard, with extended delete and escape keys. It was one of the last to have these full keyboards, before Lenovo switched to the island style keyboards. In addition to its TrackPoint and keyboard, the T420 also has a trackpad. The TrackPoint and trackpad together are known as the ThinkPad UltraNav system. The TrackPoint has 3 buttons: a left mouse button, a right mouse button, and a scroll bar (also a button), used for scrolling with the TrackPoint. These buttons are located just below the spacebar, and just above the trackpad. The trackpad has 2 buttons: a left mouse button, and a right mouse button. They are located just below the trackpad, on the very edge of the palmrest.

Keyboards

There were 3 companies responsible for producing T420 keyboards: Alps, Chicony, and NMB (LiteOn). I've seen conflicting testimony as to the quality differences in these keyboards, but there seems to be consensus in preference for either the NMB or Alps (less often) over the Chicony. This appears to be reflected in the availability of spare keyboards for sale. I found a lot of Chicony keyboards, a few NMB keyboards, and barely any Alps keyboards for sale. There are also many that don't have a sticker showing the FRU#. I don't know if that means they're unlicensed knock-offs (likely), or just refurbished parts that lost their stickers.

There are 37 different regional/language keyboard layouts, with each layout being produced by 3 different companies, leading to 111 different FRU numbers. Consult the table below to find the FRU number for your preferred layout and manufacturer.

For procedures related to replacing the keyboard, please refer to Chapter 8. Removing and replacing a FRU, section 1010 Battery pack, page 77, in the hardware maintenance manual.

Table 20. Parts list – keyboard

Language	FRU no.		
	Alps	**Chicony**	**NMB**
Arabic	45N2076	45N2146	45N2216
Belgian	45N2077	45N2147	45N2217
Brazilian Portuguese	45N2075	45N2145	45N2215
Bulgarian	45N2078	45N2148	45N2218
Canadian French (058)	45N2073	45N2143	45N2213
Canadian French (Acnor)	45N2072	45N2142	45N2212
Czech	45N2079	45N2149	45N2219
Danish	45N2080	45N2150	45N2220
Finnish, Swedish	45N2097	45N2167	45N2237
French	45N2082	45N2152	45N2222
German	45N2083	45N2153	45N2223
Greek (U. S. English and Greek layout)	45N2084	45N2154	45N2224
Hebrew	45N2085	45N2155	45N2225
Hungarian	45N2086	45N2156	45N2226
Icelandic	45N2087	45N2157	45N2227
Indian	63Y0219	63Y0221	63Y0223
Italian	45N2088	45N2158	45N2228
Japanese	45N2102	45N2172	45N2242
Kazakhstan	45N2089	45N2159	45N2229
Korean	45N2103	45N2173	45N2243
Latin American Spanish	45N2074	45N2144	45N2214
Norwegian	45N2091	45N2161	45N2231
Polish	45N2092	45N2162	45N2232

Table 20. Parts list – keyboard (continued)

Portuguese	45N2093	45N2163	45N2233
Russian	45N2094	45N2164	45N2234
Slovak	45N2095	45N2165	45N2235
Slovenian	45N2096	45N2166	45N2236
Spanish	45N2081	45N2151	45N2221
Swiss	45N2098	45N2168	45N2238
Thai	45N2105	45N2175	45N2245
Traditional Chinese	45N2104	45N2174	45N2244
Turkish	45N2099	45N2169	45N2239
U.K. English	45N2100	45N2170	45N2240
U.S. English	45N2071	45N2141	45N2211
U.S. English (International, with a Euro symbol)	45N2101	45N2171	45N2241
Netherlands	45N2090	45N2160	45N2230
Turkish (F Type)	60Y9552	60Y9554	60Y9550

TrackPoint

“The TrackPoint pointing device consists of a pointing stick on the keyboard and three click buttons at the bottom of the keyboard. To move the pointer on the screen, you apply pressure to the nonslip cap on the pointing stick in any direction parallel to the keyboard; the pointing stick itself does not move. The speed at which the pointer moves depends on the pressure you apply to the pointing stick. The functions of the left (4) and right (2) click buttons correspond to those of the left and right mouse buttons on a conventional mouse. The TrackPoint center button (3), called the scroll bar, enables you to scroll Web pages or documents in any direction with no need to use the graphic scroll bars on the side of the window.” – from the T420 User Guide, page 34.

The TrackPoint is part of the keyboard assembly, and cannot be separated normally. About the only thing you can change about the TrackPoint is the cap. There are 3 official types of TrackPoint caps that fit the T420: the classic dome, the soft dome, and the soft rim. They come in one color: red. You can find a 3-Pack under the FRU #91P9642. There are lots of aftermarket TrackPoint caps that are

made of something that looks more like silicone than rubber. ~~Though I have not used them, I can imagine that they are more slippery than rubber caps~~. These aftermarket caps don't feel as nice, don't look as nice, and have a poor finish (visible mold lines, flash, etc.). You may find this is something you like, or at least something that is acceptable, so don't let me stop you from giving it a try.

Table 21. Parts list – TrackPoint caps

FRU	FRU no.
TrackPoint caps	91P9642

Besides the 3 official styles of TrackPoint cap, there aren't many viable aftermarket options for caps. TrackPoint technology was licensed to other companies, and some of them did produce compatible TrackPoint caps. One such company was Toshiba. I did manage to track down some alternative TrackPoint caps at the following sites:

Trackcap.com
This site was difficult to navigate, until I realized the menu of products is a little below the header image, not directly below it, but midway down the page, as a horizontal list of manufacturers: HP Compaq, Toshiba, IBM, etc. They sell the classic dome caps, and also, square post Toshiba caps that appear to be the same dimensions, but come in blue or green instead of red. Be careful, as they also offer Toshiba TrackPoint caps that fit a round post. They are darker green, and most likely do not work well with the T420's square post TrackPoint.

Unicomp
Unicomp sells the real old, non-textured eraser-head TrackPoint caps, for all the nihilists out there.

Other than those, I didn't find anything unique that applies to the T420 specifically. There are Dell and HP TrackPoint caps that have a 4mm square post hole, but the external diameter of the caps may be a little larger. It's definitely worth looking into, as they may fit on some ThinkPad models, but I am concerned that they may fit too snuggly between the keycaps.

There used to be TrackPoint caps in the style of the classic dome caps, available on eBay that came in raspberry and green colors, but I haven't been able to find them in the last decade or so. Whoever was producing them probably stopped doing so. If you're lucky, you may find some of those floating around.

Trackpad

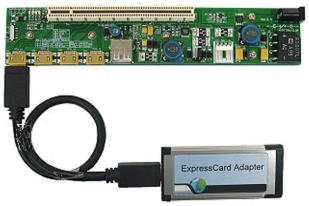
The trackpad on the T420 often shows wear on the patterned texture that covers its surface. Luckily, this texture is a sticker, and can ~~easily~~ be replaced. It takes some scrubbing, very light scrubbing(!), and lots of time to remove the adhesive. It won't just peel off, it's going to take some work. After it's fully removed, just search your favorite online retailer for "T420 trackpad stickers" and you'll find plenty of results. Technically, I think it's under FRU#04W1603 as Face sheet - touchpad, but it's one of those multi-part FRUs, so it probably won't help you find one. Or, you could just leave it clean, and not replace the sticker. Personally, I prefer this non-textured feel. There's less resistance when moving my fingers across the surface.

If you're having issues with the functioning of the trackpad unit itself, it can easily be replaced as well. The trackpad is considered part of the keyboard bezel assembly (FRU# 04W1371).

For procedures related to replacing the trackpad, please refer to Chapter 8. Removing and replacing a FRU, section 1120 Keyboard bezel assembly, FPC cable, and Bluetooth daughter card, page 87, in the hardware maintenance manual.

Chapter 11. ExpressCard Slot

The T420 has a single ExpressCard 34 slot. An ExpressCard slot is essentially an external port to a single PCIe lane. There are many different ExpressCards available, but unfortunately, not many of them are generally useful. There are serial ports, obsolete 3G modems, network cards, and so on. There are two really useful cards, thankfully. The T420 lacks USB 3.0 ports, which can make transfers from flash drives painfully slow. There is a USB 3.0 ExpressCard that gives you two USB 3.0 ports, flush with the side of the device. It's a really clean solution to a real problem. The other really useful ExpressCard is an ExpressCard to PCIe adapter that lets you connect a desktop graphics card to the T420. Because it's only a single PCIe lane, and an older system, you're not going to be able to use a card newer than the GTX 900 series, and it will seriously impact battery life.



Chapter 12. Bluetooth

Bluetooth was a stock option on the T420. If your T420 came with bluetooth, fantastic! If not, you could purchase and install the bluetooth daughter card, however, the stock bluetooth module is Bluetooth 3.0, and isn't guaranteed to play nice with newer devices. There is a slightly newer module introduced with the XX30 series, which has bluetooth 4.0 instead of 3.0. This module is compatible, and can be swapped out, however, with a modded BIOS, or CoreBoot, the WiFi card whitelist is removed, and you can install a modern WiFi card that incorporates a newer bluetooth standard, like bluetooth 5.0. You also get the benefit of a newer WiFi standard. This is the recommended course of action, whether you have bluetooth already, or not. Something to keep in mind, in one specific scenario, a scenario which this guide recommends against anyway, but if you don't have stock bluetooth, and want to add the bluetooth daughter card, your system likely doesn't have the bluetooth symbol on the LCD bezel. When bluetooth is connected/active, there's a corresponding light on the LCD bezel, located between the HDD activity and wifi activity lights. There are different stickers applied to the LCD bezel, technically referred to as the clear plate kit, depending on what's installed. The solution to this is to get a replacement clear plate kit. These can be found on eBay or AliExpress pretty easily. I found a few by searching for "t420 sticker light."

For procedures related to replacing the bluetooth daughter board, please refer to Chapter 8. Removing and replacing a FRU, section 1120 Keyboard bezel assembly, FPC cable, and Bluetooth daughter card, page 87, in the hardware maintenance manual.

Table 22. Parts list – Bluetooth daughter board

FRU	FRU no.
Bluetooth daughter card (BDC-3.0)	91P9642
Bluetooth daughter card (BDC-4.0)	60Y3303 60Y3305

Chapter 13. Fingerprint Reader

Some models came equipped with a fingerprint reader, located on the keyboard bezel assembly, to the right of the trackpad (the right palm rest area). If your T420 does not have a fingerprint reader, and you'd like to add one, all you need to do is purchase a keyboard bezel assembly with the fingerprint reader attached. The fingerprint reader cable is attached to the trackpad, which is part of the keyboard bezel assembly. DO NOT buy just the fingerprint reader board and cable if you're not just replacing a broken unit. Devices that didn't ship with a fingerprint reader lack the hole in the keyboard bezel assembly that's necessary to make use of the fingerprint reader. So if you're adding it to a unit that didn't ship with it, you MUST buy a keyboard bezel assembly with an attached fingerprint reader.

Refer to Chapter 1. Enclosure Parts, subsection Keyboard bezel assembly for FRU numbers.

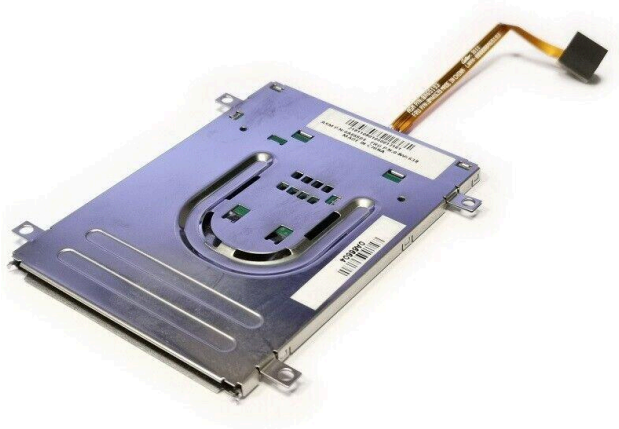
For procedures related to replacing/adding a fingerprint reader, please refer to Chapter 8. Removing and replacing a FRU, section 1120 Keyboard bezel assembly, FPC cable, and Bluetooth daughter card, page 87, in the hardware maintenance manual.

Chapter 14. SmartCard Reader

SmartCards are mainly used as a form of 2-factor authentication. Usually used in enterprise settings, in order to login to a device, you have to provide a password while your SmartCard is inserted into the device. Without both the SmartCard, and your password, logging in isn't possible. SmartCards are also used for municipal transit payment cards, in some countries, and someone with a SmartCard reader can refill funds on a transit card directly on their laptop. If your T420 didn't come with a SmartCard reader, one can be added about as easily as any other part in this guide. Just keep in mind that if you're adding a SmartCard reader, and not replacing a broken unit, you're going to need the HDD cover with the slot for the SmartCard reader (FRU# 04W1637). Be careful when using the FRU# to search for replacement parts, as the FRU# for the HDD cover is for both styles of cover. Also, it won't necessarily come with the cable, so make sure to purchase it separately if it's not included.

FRU	FRU no.
SmartCard Reader	04W1638 04W2084

FRU	FRU no.
SmartCard Reader FPC cable	04W1639



For procedures related to replacing/adding a SmartCard reader, please refer to Chapter 8. Removing and replacing a FRU, section 1130 SmartCard, page 92, in the hardware maintenance manual.

Chapter 15. UltraBay Slot

The T420 has one Serial UltraBay Enhanced slot. There are 5 official accessories that fit the UltraBay slot: a DVD drive, a Combo drive, a Multi drive, a HDD caddy, and the travel bezel (dummy card). You may have a use for an optical drive, but most often, the best use of the UltraBay slot is the HDD caddy. It's just as easy to mount a drive here as in the standard HDD slot, with the appropriate caddy.

Honestly, you could adapt an UltraBay frame for use with any SATA device that can fit in the frame, as the Serial UltraBay Enhanced uses a standard slimline SATA connector. That's still mostly optical drives and hard drives, but nice to know nonetheless.

Chapter 16. Wireless Cards

The T420 has two PCIe express slots for wireless cards, one intended for wireless LAN, and one intended for wireless WAN. I say intended for because there are antenna leads running to both, and also because you don't have to use them as intended.

Wireless WAN

If your T420 came with a wireless WAN card, it's essentially useless, as 3G has been decommissioned. A common use for the wireless WAN slot is to replace the wireless WAN card with mSATA solid state drive.

There are more modern WWAN cards available, for networks like 4G/LTE or even 5G. Whether or not these will work on the T420 is hard to say, for a few reasons. First, there may be a WWAN card whitelist (I still haven't been able to confirm this), just like there is for WLAN cards. Second, the PCIe slot for the WWAN card is a mini PCIe/mSATA combo slot. So it should work for cards that use the USB signaling over mini PCIe standard, but it can be hard to tell which cards fit that description. While the first issue can be overcome with a modded BIOS, or by using CoreBoot, the second issue requires some real digging, and potentially some trial and error, all to solve a problem that's more easily resolved by using your phone's hotspot. If you really want to make it happen, it's probably doable, just not the most efficient solution.

Wireless LAN

With a stock BIOS, your T420 is restricted to a set list of acceptable wireless LAN cards. Although it's possible that there's a white-listed WiFi card that's better than the one you currently have, none of them are better than wireless N, and none of them have bluetooth. By installing a modded BIOS, or installing CoreBoot, the wireless LAN whitelist is eliminated, and you can use whatever appropriately sized card you want. Your T420 can have both WiFi AC and bluetooth 5.0.

Chapter 17. Accessories

Ultrabay Enhanced 12.7mm

Serial ATA Hard Drive 9.5mm Bay Adapter III - 43N3412

Serial ATA Hard Drive 12.7mm Bay Adapter III - 0A65623

DVD Burner Ultrabay Enhanced Drive III - 0A65625

ThinkPad Expansion

Lenovo Essential Notebook Stand - 45J9292

ThinkPad Port Replicator Series 3 with USB 3.0 - 433615W

ThinkPad Mini Dock Series 3 - 90W - 433710U

ThinkPad Mini Dock Series 3 w/ USB 3.0 - 90W - 433715U

TP Mini Dock Plus Series 3 w/ USB 3.0 - 90W - 433815U

TP Mini Dock Plus Series 3 w/ USB 3.0 - 170W - 433835U

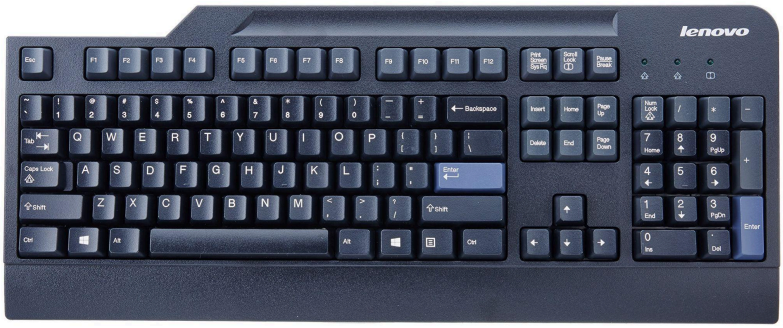
Keyboard

TrackPoint Cap Collection - 73P2698

Ultraslim Plus Wireless Keyboard and Mouse - 0A34032

USB Numeric Keypad - 33L3225

Preferred Pro USB Keyboard - 73P5220



Enhanced Performance USB Keyboard - 73P2620

ThinkPad USB Keyboard with TrackPoint - 55Y9003

Lenovo USB Fingerprint Keyboard - 73P4730

Lenovo USB Smartcard Keyboard - 51J0155

Mouse

Lenovo Optical Mouse (USB) - 06P4069

Lenovo Laser Mouse (USB) - 41U3074

ThinkPad USB Laser Mouse - 57Y4635

Lenovo ScrollPoint Mouse (USB, Optical) - 31P7405

ThinkPad Travel Mouse (USB, Optical) - 31P7410

ThinkPad Bluetooth Laser Mouse - 0A36407

Lenovo Wireless Laser Mouse - 0A36188

Multimedia

ThinkPad In-Ear Headphones with mic - 57Y4488

Security

3M 14.0W Privacy Filter from Lenovo - 0A61769

Kensington MicroSaver Cable Lock - 73P2582

Kensington Twin Head Cable Lock - 45K1620

Lenovo Security Cable Lock - 57Y4303

USB Gemplus GemPC Smart Card Reader - 41N3040

Batteries

ThinkPad Battery 70+ (6-cell) - 0A36302

ThinkPad Battery 70++ (9-cell) - 0A36303

ThinkPad Battery 28++ (9-cell, slice) - 0A36304

ThinkPad External Battery Charger - 40Y7625

ThinkPad 65W AC Adapter - 40Y7696

ThinkPad 90W AC Adapter - 40Y7659

90W Ultraslim AC/DC Combo Adapter - 41R4493

iPod and iPhone Charge Tip - 41R4481

Generic Micro USB Charge tip - 41R4490

Carrying Cases

ThinkPad 14W Case Sleeve - 57Y4294

ThinkPad 15W Case Sleeve - 51J0477

Lenovo Messenger Max - 41U5253

Lenovo Performance BackPack - 41U5254

ThinkPad Business Topload Case - 43R2476

ThinkPad Business Backpack - 43R2482

ThinkPad Deluxe Expander Case - 43R2478

ThinkPad Executive Leather Case - 43R2480

Lenovo Sport Backpack - Red - 0A33896

Lenovo Sport Slimcase - Red - 0A33897

Lenovo Sport Messenger - Red - 0A33898

Monitors

ThinkVision L1711p 17” (VGA, DVI-D) - 5047HB2

ThinkVision L1900p 19” (VGA, DVI-D) - 4431HE1

ThinkVision LT1952p Wide 19” (VGA, DP, DVI-D) - 2448MB6

ThinkVision L2250p Wide 22” (VGA, DVI-D) - 2572HB6

ThinkVision L2251x Wide 22” (VGA, DP) - 2578HB6

ThinkVision LT2252p Wide 22” (VGA, DP, DVI-D) - 2572MB6

ThinkVision LT2452p Wide 24” (VGA, DP, DVI-D) - 4420MB2

ThinkVision LT1421 Wide 14” Mobile Monitor with Protective Screen Cover (USB 2.0) - 1452DS6

Monitor Accessories

DisplayPort to Single-link DVI-D Cable - 45J7915

DisplayPort to DisplayPort Monitor Cable - 0A36537

Lenovo USB Soundbar - 0A36190

Lenovo Easy Reach Monitor Stand - 55Y9258

Mini Docks Series 3 lock onto these!

Chapter 18. Modifications

I truly expected there to be plenty of pre-existing mods for the T420, but honestly, there's not a lot out there. I think there's a little bit of you can't fix what's not broken going on here, but also a bit of a vacuum for a capable hacker. There are still plenty of things that could be done to a T420 that haven't been done before. If you've got what you think is a good idea, give it a shot! Parts for this device are fairly cheap, and if we're not talking about a low production number regional keyboard, parts are plentiful on the used market! Buy a spare part and tinker away, just be sure to share your results with the community over at r/thinkpad!

IPS Screen Mod

There were two stock 14.1" screens for the T420: a 1366x769 and a 1600x900. Given that this generation of ThinkPads only came with TN (Twisted Nematic) LCD screens, it's no surprise that the most popular hardware mod is switching that screen out for an IPS (In-Plane Switching) screen. IPS is brighter, has better color reproduction, much better viewing angles, and full HD resolution, or better. It requires not only replacing the screen, but also adding a controller card. There are many guides available online that walk you through the process.

USB-C PD Charging Port Mod

The USB-C PD Charging Port Mod is a replacement for the standard barrel jack charging port. It's wired with the same connector as the stock charging port, so it's a super easy modification, allowing you to charge with the increasingly ubiquitous USB-C charging cable (also works for the T430). It requires a 65W 20V 3.25A USB-C PD charging block or a 90W 20V 4.5A USB-C PD charging block if you have discrete graphics and/or a quad core CPU. There are two different versions of the mod, depending on whether you intend to use a 65W or 90W charger, so be aware when you purchase.

Bluetooth Module Swap

This was covered in Chapter 12. Bluetooth, but it's relevant here too. The Bluetooth module from the next generation of ThinkPads, the XX30 series, uses the same connector as the T420's Bluetooth module, and they are interchangeable. As mentioned earlier, this can allow you to use Bluetooth 4.0 instead of 3.0 with an official module. If you don't have any devices that make use of Bluetooth 5.0 or better, then this solution would work for you.

Pros:

- Built-in Bluetooth indicator light works.

Cons:

- Not the latest Bluetooth standards.

USB-C 3.1 Port Mod

This mod adds a USB-C 3.1 port to the UltraBay slot, using an UltraBay HDD caddy. This mod is not completely clean (causes non-fatal boot error), and has a few minor issues (No Thunderbolt or PD, cannot be used for input charge to the laptop), but it is functional.

USB-C 3.1 Mod

Open Source Battery

This is a guide to building your own replacement 9-cell battery for the T420. It's not without a few issues, but it does work, and it's a pretty complete design. There are KiCad files for making the required PCB, and 3D models for printing an enclosure that emulates the original battery enclosure. Keep an eye on this project for future refinements.

Open Source T420 Battery

UltraBay Slot RaspberryPi Housing

This is a fun one. It's a housing for a RaspberryPi Zero and a tiny screen that fits in and is powered by the UltraBay slot! The GPIO connector is oriented so that it's accessible from the outside, and it even includes storage space for a small breadboard!

UltraBay Slot RaspberryPi Housing with Screen and GPIO Connector

Chapter 19. Printable Parts

Replacement parts for the T420 are not hard to come by, but there will come a time when parts become scarce. If you're having a great deal of difficulty finding a particular part, sometimes your only option is to make one. The following list of parts can be printed at home if you own a 3D printer, and if not, there are many online marketplaces where people who do have 3D printers will print the part and ship it to you.

HDD Cover

Lenovo T420 HDD Cover

This first example was designed by measuring the HDD cover with calipers, as precisely as possible. 3D printed parts tend to be less durable than injection molded plastic, or other industrial manufacturing methods, so you may want to experiment with and modify this print to your needs. It should fit, but may require a little sanding to make it fit cleanly. I don't think that this design has been rigorously field tested, and the designer suggests perhaps reinforcing some areas of the model.

Lenovo T420 Hard Drive Bay Cover

This second example was designed by measuring the empty space of the HDD bay instead of the HDD cover itself. You can see in the images, if you follow the link, that this part isn't even close to an exact fit (especially near the front edge, although this could be sanded out). You also may want to remove the embossed words "THE RODGE" from the model.

HDD Slot

SSD Rails 7mm to 9.5mm ThinkPad T420

These rails allow you to mount a 7mm HDD in the HDD slot.

ThinkPad T420 9.5mm Hard Drive Rail

These rails allow you to mount a 9.5mm HDD in the HDD slot.

UltraBay Slot

UltraBay Slim to UltraBay Adaptor

This part lets you use an UltraBay Slim device in a standard UltraBay Slot. It's just a 2.9mm shim to fill the empty space.

ThinkPad T420 Optical Drive Blank

This part serves the same purpose as the Travel Bezel, but in a more practical fashion. If you don't use an optical drive or a hard drive caddy in your UltraBay slot, you can use this drawer instead. It won't hold much, but you store a few flash drives, or, you know, more than just air.

Lenovo T420 CD Bay Cover

Despite the name, this has nothing to do with CDs or even optical drives. This is a replacement exterior cover plate for the HDD caddy that fits in the UltraBay Slot.

Webcam Covers

Lenovo ThinkPad T420 Camera Cover

Webcam Cover Lenovo ThinkPad

ExpressCard Slot

ExpressCard 34 Dummy

Alternative dummy card for the ExpressCard slot. This one has a solid base as opposed to the honeycomb lattice on the official dummy card. As such, it can be used as a tiny drawer.

Battery

Battery Latch Slider

This is a replacement part for the sliding latch with 3 hooks in the T420 battery.

Stands and Legs

ThinkPad Leg/Stand

These are little folding legs that can be attached anywhere on the bottom surface with double-sided tape, though ideally only 2 of them toward the back. Adds a slight angle, which improves airflow for thermal management, and allows for more comfortable typing.

ThinkPad T420 Vertical Stand

When the screen is lifted all the way open so that the device lays flat, the base can be inserted into 2 of these stands in order to hold the entire device upright.

Lenovo ThinkPad T420 Stand

Similar in function to the previous stand, this one is a unibody design that incorporates a small bin in the front.

Appendix A. Notices