
WARNING!!! PROCEED AT YOUR OWN RISK!!! YOU -CAN- EASILY DESTROY AND DAMAGE YOUR LIBRETTO BEYOND REPAIR!!! DO NOT USE OR FOLLOW THESE INSTRUCTIONS IF YOU ARE UNSURE, OR IF YOU DO NOT WANT TO TAKE THE RISK OF OVERCLOCKING YOUR MACHINE AND VOIDING YOUR WARRENTY!!!

Speed doesn't kill. Poor design and mistakes do.

New!

- [4 April] Updated the layout of the site.
- **The Libretto 100 can be overclocked from 166Mhz to 200, 233, and 266 Mhz!!!** Outstanding performance, a stunning mini-notebook overclocked. [Download](#) the L100 overclocking picture today <80KB>. Note: 90% success rates @ 266Mhz of 16 people who tried and told me. The others had to run the Libretto at slower speeds due to the usual overheating and timing issues that arise from CPUs and systems that simply weren't able to handle the extra speed.
Note: You can use the same techniques for the L110 as well. If you want other pictures to cross-verify before you start, look at Xin's and About the Libretto! listed on my main page under the Overclocking section.
Note: It has been noted by one person that the motherboard layout of his L100 did not match the image I have on my site of the L100 - assume this to be a newer motherboard release. Send me a picture if you've got one of the newer motherboards so we can figure out the differences.
- Some of the latest L50s have been shipping with underclocked P120 chips in place of the discontinued P75 chips! This is an overclocker's dream because you can easily clock it back up to a stable 133Mhz, or faster 166Mhz, for outstanding performance from this \$900 (USD) Libretto. Buy one now before these bargains are gone and turn them into a speed demon for less than a new L70 (120 Mhz, \$1900) or L100 (166 Mhz, \$2300)!

The only way to be sure you have a P120Mhz CPU in your L50 is to take it apart and read the printing on the top of the CPU!!!

One person's L50 with the P120 CPU had these numbers on the bottom of his L50 (he ordered through CDW). You can try to buy a L50 with a later serial number, but again, this is no guarantee that Toshiba serial numbers go in ascending order or that you will get a L50 with a P120 CPU. You can try your luck by ordering through CDW (www.cdw.com) and other places that have fresh stock from Toshiba of the L50. *Most of the time*, you will probably get a L50 with the P120 CPU but this is no guarantee it will have the P120 CPU. Most L50s made this year will probably have the P120 CPU.

50CT/810
Model #: PA1249U X
Part #: PA1249U-T2A
Serial#: Z7457948-1
Product of Japan

Introduction

Overclocking the Libretto has seen many wonderful developments during the past several years, almost as exciting and suprising as the release of each new model. Overclocking a computer makes it run faster. You benefit from increased performance with your current system with a few short hours spent modifying your Libretto. Running a system faster than it was designed can cause complete or partial system failure. This is a risk you take if you decide to proceed. Most Librettos can be moderately overclocked with a high chance of success and dozens, if not hundreds, of people have already done so (I'd say 95% or higher in most cases.)

Background

From the beginning of time, humans have sought to go farther and faster than before. Overclocking a computer is one outlet through which we can focus our abilities and ingenuity to extend our machines with better performance.

Two elements play the crucial parts in controlling the speed of your computer - the CPU clock multiplier and the system bus speed. In the old days, the CPU typically ran at the same speed as the rest of the major system components, the system bus speed. But at faster processor speeds, the manufacturers usually decouple the two because most system components do not run as quickly. You will typically see the processor speed, the bus speed and CPU clock multiplier multiplied together, listed as the speed of your computer system. The clock multiplier affects only the `_internal speed_` of the CPU and no other components.

The bus speed (or base frequency) governs the speed at which major components of the system talk to each other and the CPU. RAM, secondary cache (L2), PCI devices, video, and hard drives are all affected by changes in the bus speed. These devices must all be able to run at higher speeds when you raise the bus speed, otherwise, the overclocking effort will be unsuccessful.

Because the bus speed affects all components, the CPU itself will also try to run at the 'faster' speed when you raise the bus speed. In effect, you compress time and make the components think they have to do the same work in less time, so they work faster. Raising bus speed will always give you a bigger increase in system performance than if you raised the clock multiplier to achieve the same system speed (where only the CPU is faster and nothing else is).

(eg. We calculate how fast the CPU runs by multiplying the bus speed by the clock multiplier. $50 \text{ Mhz} \times 2 = 100 \text{ Mhz}$, where 50 is the bus speed, 2 is the clock multiplier, and 100 is the usually the listed processor/system speed; Mhz = megahertz = one million cycles per second; processor=CPU; CPUs can perform at least one basic instruction/command per cycle.)

People have overclocked computer systems since they have been available. Apple IIs, TRS-80s, Macintoshes, and IBM PC-compatible machines are some of the systems that people have overclocked. The overriding goal is faster performance using the same components using a few, if any, inexpensively added parts for a low cost, or just to see if it can be done.

Sometimes, commercial devices are available which perform the overclocking easily and without much fuss; also available are devices which do not overclock the system, but do replace some of the original components with those which are rated for and run at faster speeds. Commercial overclocking examples include the faster clock oscillators for the Apple II and TRS-80s; commercial accelerator devices include processor cards for the Macintosh, and the Overdrive processors for PCs.

Both options are available for the Toshiba Libretto computers. This article will over the homemade changes that can be made and briefly list vendors who can overclock your Libretto for you at a charge.

Different processors will affect the performance of any system and the possibility and success of

overclocking attempts. In general, newer processors will run at faster speeds due to improved manufacturing techniques and cooler operating temperatures due to the use of smaller die sizes (0.5 micron = 486, oldest 586 chips; 0.35 micron = most 586 chips; 0.25 micron = most newer chips, including 586 with MMX chips; 586=Pentium).

Naturally, all electronic devices consume power. For our concerns, as the speed increases, whether bus or CPU, power consumption will increase and result in a decrease in battery life. Also, faster running chips want to draw more power to run correctly at higher chips and the design of the Libretto 50 motherboard may not be able to supply enough power, especially to the CPU for correct operation at higher speeds.

Faster running components also produce much more heat than slower systems and affects the proper operation of any system. While you can easily drop a big heatsink and fan in an overclocked desktop system, there is no space available in the Libretto, so short of using it in a freezer or Alaska, an overclocked system may not be able to run successfully at higher temperatures (ie. shutdown, burn, melt, die). You can compensate by running the Libretto on an ice block, using a PCMCIA fan, or turning down the power settings.

A problem that may appear at higher speeds is that CPU power consumption increases. On a desktop system, you simply increase the input voltage to the CPU, but you can't do this on the Libretto. This means that while you can overclock to faster speeds, the chip may not run stable due to the lack of power. This is usually seen on desktops, but has not been reported on any Libretto yet.

Recently it has been discovered that Intel has stopped connecting the proper pins and internal circuitry in many, but not all, of its newer chips which allows the selection of out-of-range clock multipliers for the CPU. This directly prevents chip overclocking, and the sole purpose of this is to prevent people from using their chips outside of rated specifications. This directly affects most MMX chips and all Pentium II chips. The workaround is to buy Librettos with older non-limited Intel chip, or for PCs in general, buy computers with AMD or Cyrix processors, which offer good performance for the price.

"The mobile Pentium processor with MMX technology with 0.25 micro process uses BF0, BF1, and BF2 pins to determine the bus-to-core frequency ratio."

"Operation out of specification is not supported. For example, a 200Mhz processor only supports" *a 3x clock multiplier* "and not" *other* "modes." (Intel Pentium Processor Specification Update)

(Bad Intel! Bad!)

Happily, no Libretto is affected and all models can be overclocked, from the L20 through the L100.

(This is similar to electronic speed limiters used in cars. The best way around this is to replace it with a third party control unit/chip that lets you drive the car as fast as you'd like.)

Important Specifications

Libretto	20	30	50	60	70	100
CPU/processor	AMD Am486DX4/75	AMD Am5x86/100	Pentium 75 / Pentium 120	Pentium 100	Pentium 120 MMX	Pentium 166 MMX
System speed	75 Mhz	100	75	100	120	166
Bus speed	25 Mhz	33	50	50	60	66

Clock multiplier	3	4	1.5	2	2	2.5
CPU voltage(s)	3.3 V	3.3	2.9 / 3.3	2.9 / 3.3	2.2 / 3.3	1.8 / 2.5
Process/Die size	0.5 micron	0.35	0.35 / ?	0.35	0.35	0.25
Average Thermal Generation	2.0 Watts	2.0	1.7-2.3	2-3	3.4	2.3
Maximum Thermal Generation	2.5 Watts	2.3	4.4	5.9	5.7	4.1
Maximum System Power Consumption		10 Watts	20	22	22	25
Available options (default in bold)						
Stable Recommended Overclock Speed	100 Mhz	133	100 / 133	133	166	233
Maximum Recommended Overclock Speed	100 Mhz	133	133 / 166	166	166	266
Maximum Available Overclock Speed	120? Mhz	160?	200	200	200	266
Bus speeds	25 , 33	25 , 33	40, 50 , 60, 66	40, 50 , 60, 66	40, 50, 60 , 66	66
Clock multipliers	2, 3	3, 4	1.5 , 2.0, 2.5, 3.0	1.5, 2.0 , 2.5, 3.0	1.5, 2.0 , 2.5, 3.0	2.5 , 3.0, 3.5, 4.0
Average Thermal Generation	100 Mhz: 2.6 Watts	133: 2.7	100: 2-3 (L50 only) 120: 2.5-3.5 133: 3-4 150: 3.8-5 (needs 3.1V Vcc)			200: 2.7 233: 3 266: 4.5 (needs 2.0V Vcc)
Maximum Thermal Generation	100: 3.3	133: 3.1	100: 5.9 (L50 only) 120: 7.1 133: 7.9 150: 10 (needs 3.1V Vcc)			200: 5.0 233: 5.5 266: 7.6 (needs 2.0V Vcc)

Controlling the Bus Speed

The bus speed (or base frequency) is governed by a PLL on the Libretto 20, 30, 50, 60 and 70 motherboards. It is the W48C54A manufactured by IC Works, Inc. located at 3725 N. 1st Street, San Jose, CA 95134-1700, (800) 888-WRKS for product literature, (408) 922-0202 x1131 for press relations.

There are two pins on this chip of interest to us: 15 & 16. Together, they can generate up to four different bus speeds.

W48C54A PLL IC				
Pins		Bus Speed		
15	16	L20	L30	L50, 60 & 70
1	0	25*	25*	40 Mhz

1	1	33	33	50**
0	0	--	--	60***
0	1	16	16	66

- 1 Connect pin to Vcc (Positive Voltage)
- 0 Connect pin to Vss (Ground/0 Volts)
- * L20 & L30 default
- ** L50 & L60 default
- *** L70 default
- Unknown/unsupported

You can also underclock your system (slow it down) by selecting slower bus speeds.

Example: To raise the bus speed of a L50 to 66Mhz, cut pin 15 and connect to ground or leave it floating.
 L50 @ 75Mhz (50Mhz x 1.5) -> L50 @ 100Mhz (66Mhz x 1.5)

Controlling the Clock Multiplier

The clock multiplier is governed by two pins on the CPU in the L20-70 and three pins on the L100. These pins are available outside the CPU on the motherboard as solder points in the L50-70. By connecting these pins together, to a ground (Vss) or positive source (Vcc) with wires and/or diodes, you can adjust the internal clock multiplier of the CPU.

If you use a diode rather than a wire, you can switch between two different speeds in the L50-70 on bootup (eg. 185/186 --- >| --- 57) by choosing whether you hold the power button down until bootup beep or not. You can this diode for the connection: 1N4148.

CPU Clock Multiplier pins			
Libretto 20 & 30	CLKMUL Pin 11		
3x	1 High / Vcc / Floating / Positive Voltage		
4x	0 Low / Vss / Ground / 0 Volts		
Libretto 50, 60 & 70	BF1 Pin 185	BF0 Pin 186	
1.5x (L50)	1 High / Vcc / Positive Voltage	1 High / Vcc / Positive Voltage	
2x (L60/L70)	1 High / Vcc / Positive Voltage	0 Low / Vss / Ground / Pin 57	
2.5x	0 Low / Vss / Ground / Pin 57	0 Low / Vss / Ground / Pin 57	
3x	0	1 High / Vcc / Positive	

		Low / Vss / Ground / Pin 57	Voltage
Libretto 100	BF2 Pin 184	BF1 Pin 185	BF0 Pin 186
2x	0 Low / Vss / Ground	1 High / Vcc / Positive Voltage	0 Low / Vss / Ground
2.5x	0 Low / Vss / Ground	0 Low / Vss / Ground	0 Low / Vss / Ground
3x	0 Low / Vss / Ground	0 Low / Vss / Ground	1 High / Vcc / Positive Voltage
3.5x	0 Low / Vss / Ground	1 High / Vcc / Positive Voltage	1 High / Vcc / Positive Voltage
4x	1 High / Vcc / Positive Voltage	0 Low / Vss / Ground	0 Low / Vss / Ground

Quick Start

Refer to my main site for links to Bell's Laboratory, Toshiba Note-PC Extender's, and Fast & First pages and others for detailed pictures on disassembling the Libretto and making the modifications. Toshio's site has step-by-step instructions in Japanese with accompanying pictures. Refer to Tom's Hardware for detailed background notes, overclocking results from hundreds of desktop users (applicable because it shows how likely our efforts at overclocking the Libretto will be) and detailed articles covering system components and performance.

Libretto 20 & 30

You can increase the speed by changing the bus speed from 25Mhz to 33Mhz. You can also change the cache from the slower write-through to the faster write-back setting for increased performance. The L20 & L30 runs well at the faster speeds with no reported problems.

- L20:75->100 Mhz, L30: 100->133Mhz
To change the bus speed, simply locate the W48C54A IC on the motherboard and cut pin 16 (can't be connected to both the motherboard and pin 15 at the same time) and connect to pin 15.
- To enable the write-back cache, connect the 64th pin on the CPU to any Vcc source (high / positive voltage) such as pin 62 on the CPU.

Opening the Libretto 50, 60 & 70

1. Gently pry off the strip just above the keyboard function keys. You can insert a small screwdriver on the right hand side of this strip to begin.
2. Unscrew the middle screw behind the strip that holds the keyboard in place.
3. Flip the keyboard forward to reveal the screws and metal shield underneath.
4. Unscrew four screws holding the metal shield and two black keyboard straps in place.
5. Unlock the center keyboard connector by gently moving the plastic locking mechanism forward on both sides (about 1-2mm), then remove the keyboard and metal shield.
6. Unplug the LCD connector that is revealed on the right side under the metal shield.

7. Remove 7 screws from case bottom.
8. Separate the case top (LCD panel and top part of case) from the case bottom (contains the motherboard, hard drive, and PCMCIA slot). There are tabs along the entire perimeter that keep the case together - try not to break any.
9. Remove the four screws from the metal CPU heat shield and remove the heat shield.
10. The CPU area is now revealed and you can perform the overclocking steps described below.

To find the W48C54A IC on the L50, L60 & L70

- A. Locate the headphone jack on the motherboard. The second IC to the right of it is the IC.
- B. Pin 16 is the pin on the right side of the IC (with the audio jack located to the left of the IC) closest to the edge of the motherboard and near the notch on the top of the IC. Pin 15 is just below pin 16 on the same side.

To find BF0/Pin 185 and BF1/Pin 186 on the L50, L60 & L70

- A. Locate the CPU. Locate the 32C68/32C6Z chip located next to the CPU.
- B. Orient the CPU so the 32C68/32C6Z chip is next to the lower right corner of the CPU. The Chips 65550 graphics chip will be to the right of the CPU.
- C. To the upper left of the 32C68/32C6Z chip is a smaller IC labeled 330. Above this chip, there are two pairs of solder points. To their right and also above the 330 IC are three small surface mounted resistors. The pair of solder points on the far left, closest to the CPU is of interest. The upper point is pin 186; the lower is pin 185 from the CPU. The other pair of solder points are Vss (ground / 0 Volts).

To find the F36000/440003 (NEC Japan, D78P014YGC, 9639Sep007) IC on the L50, L60, & L70

- A. Locate the CPU. The F36000/440003 IC is located right of the graphics chip (Chips 65550 IC) on the far right edge of the motherboard.
- B. To locate the 57th pin on the F36000/440003 IC, first locate pin 1. This will be to the left of the corner of the IC with a diagonal cut. Count counter-clockwise starting at pin 1 until you reach pin 57. (If you have the motherboard oriented such that the CPU is to the left of the Chips & Technology IC and the F36000/440003 chip is to the right, pin 57 will be on the left edge of the F36000/440003 IC.)

Libretto 50

(for L50s with the older Pentium 75Mhz chip)

The 100Mhz speed is the most stable and reliable of the choices. Very few problems have been reported at this speed, and only a slight increase in operating temperature is encountered. The 120 & 133Mhz speeds are possible, with a slightly greater chance of thermal shutdown in hot climates. The 150Mhz speed can be achieved, but there is a high possibility of thermal problems and reports of such have been made; the unit will run very hot at this speed. This and higher speeds are unstable and not recommended.

- L50: 75->100Mhz
Locate the W48C54A IC on the motherboard and cut pin 15.
To identify the 15th pin do this, locate the notch at one end of the chip. Looking at the chip with notch up, the 15th pin is the 2nd one down the right side.
- L50: 75->133Mhz
Do the '75->100Mhz' step above. Then connect BF0/Pin 186 to Vss (ground / 0 Volts). If you want the ability to switch between the two speeds, connect a diode between BF0/Pin 186 of the CPU and the 57th pin on the F36000/440003 (NEC Japan, D78P014YGC, 9639Sep007) IC instead.
- L50: 75->150Mhz
Connect BF1/Pin 185 to Vss (ground / 0 Volts). If you want the ability to switch between the two

speeds, connect a diode between BF1/Pin 185 of the CPU and the 57th pin on the F36000/440003 (NEC Japan, D78P014YGC, 9639Sep007) IC instead.

(for newer L50s with the underclocked Pentium 120Mhz chip)

The 133Mhz speed is the most stable and reliable of the choices with an insignificant rise in temperature. The 166Mhz speed is easily obtained with a slight increase in operating temperature and is very stable. Higher speeds are unstable and not recommended.

- L50: 75->166Mhz

Do the '75->133Mhz' step above but only connect BF0/Pin 186 to ground. Then, connect BF1/Pin 185 to Vss (ground / 0 Volts). Or if you want the ability to switch between the two speeds (133/166), connect a diode between BF1/Pin 185 of the CPU and the 57th pin on the F36000/440003 (NEC Japan, D78P014YGC, 9639Sep007) IC instead.

Libretto 60

The 120 & 133Mhz speeds are the recommended, stable choices. 150 & 166Mhz speeds are not as stable and problems at these speeds have been recorded. Higher speeds are not recommended unless your Libretto 60 has a faster rated Pentium chip similar to the newest L50s, in which case, 166Mhz can be safely recommended.

- Opening the Libretto 60

See 'Opening the Libretto 50, 60 & 70' above.

- L60: 100->133Mhz

Locate the W48C54A IC on the motherboard and cut pin 15.

Libretto 70

The 166Mhz speed is the recommended, stable choice. Higher speeds are unstable and not recommended.

- Opening the Libretto 70

See 'Opening the Libretto 50, 60 & 70' above.

- L70: 120->133Mhz

Attach pin 16 of the W48C54A IC to Vcc (ie. not ground; ie. connect to power).

- L70: 120->150Mhz

Connect CPU pin 185 (BF1) to ground (see Libretto 50 above to locate this pad). Note: You may connect this to the 57th pin of the other IC (as described for the Libretto 50 above) to enable you to switch between the two speeds.

- L70: 120->166 Mhz

Perform both the '120->133Mhz' and '120->150Mhz' upgrades above.

Locating the control pads on the Libretto 100

Refer to Fast & First's or About the Libretto! pages for pictures of the area described below.

We will need to start by identifying three contact points on the motherboard that control the clock multiplier.

Orient the motherboard so you face the back side, with the CPU on the other side. Rotate the motherboard so you have the hard drive on the right hand side and the motherboard area on the left hand side.

Locate the area with VR500, C8, C9, RM1 in the center of the motherboard area to the left of the hard drive. You will see that C9 and C8 will be printed on the board upside down, with c9 to the far left, c8 in the middle, and a set of three resistors slightly above and to the right of c8, and to the bottom and left of RM1.

These are the three control pads connected to BF2-0 (Pin 184-186) respectively from left to right (I think -- have not verified, they maybe in reverse order BF0-2.)

In any case, the L100 runs at 66Mhz bus speed x 2.5 clock multiplier = 166Mhz.

By attaching a wire to the top end of the resistor(s) (farthest from C8 and closest to RM1) and to Vcc (positive voltage/5V), you can increase the speed of the L100.

Libretto 100

- L100: 166->200Mhz
Attach BF2 (pin 184) to Vcc (positive voltage/Vcc).
- L100: 166->233Mhz
Attach BF1 (pin 185) and BF2 (pin 184) to Vcc (positive voltage/Vcc).
- L100: 166->266Mhz
Attach BF0 (pin 186) to Vcc (positive voltage/Vcc).

Again, the order may be reversed and the connections to increase the speed properly has not been verified.


However, given that Fast & First has benchmarked the L100 at these higher speeds, it is highly likely that the L100 can be easily overclocked to speeds up to 266Mhz. Whether the L100 will be stable at the highest speeds is unknown at this time.

Benchmarks


* = default/original speed

3D Bench 1.0 results


***L20** - 75 Mhz, 25 Mhz bus, 41.6




***L30** - 100 Mhz, 25 Mhz bus, 47.6




L20 - 100 Mhz, 33 Mhz bus, 55.5




***L50** - 75 Mhz, 50 Mhz bus, 55.5




L20 - 100 Mhz, 33 Mhz bus, write-back cache, 58.8



L30 - 133 Mhz, 33 Mhz bus, 62.5



***L60** - 100 Mhz, 50 Mhz bus, 62.5



L50 - 125 Mhz, 50 Mhz bus, 66.6



L30 - 133 Mhz, 33 Mhz bus, write-back cache, 71.4



L50 - 100 Mhz, 66 Mhz bus, 71.4



*L70 - 120 Mhz, 60 Mhz bus, 71.4



L60 - 133 Mhz, 66 Mhz bus, 76.9



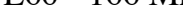
L70 - 133 Mhz, 66 Mhz bus, 76.9



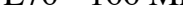
L30 - 160 Mhz, 40 Mhz bus, 83.3 (write-back cache?)



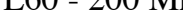
L60 - 166 Mhz, 66 Mhz bus, 83.3



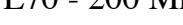
L70 - 166 Mhz, 66 Mhz bus, 83.3



L60 - 200 Mhz, 66 Mhz bus, 90.9



L70 - 200 Mhz, 66 Mhz bus, 90.9



3D Bench 1.0 results

*L20 - 75 Mhz, 25 Mhz bus, 28.5



*L30 - 100 Mhz, 25 Mhz bus, 37.5



*L50 - 75 Mhz, 50 Mhz bus, 47.6



*L60 - 100 Mhz, 50 Mhz bus, 52.6



L50 - 125 Mhz, 50 Mhz bus, 58.8



L50 - 150 Mhz, 50 Mhz bus, 62.5



*L70 - 120 Mhz, 60 Mhz bus, 66.6



L60 - 133 Mhz, 66 Mhz bus, 71.4



L70 - 166 Mhz, 66 Mhz bus, 76.9



*L100 - 166 Mhz, 66 Mhz bus, 125



L100 - 233 Mhz, 66 Mhz bus, 142.8



Windsock 3.3 results

*L20 - 75 Mhz, 25 Mhz bus, 448



***L30** - 100 Mhz, 25 Mhz bus, 613



***L50** - 75 Mhz, 50 Mhz bus, 699



***L60** - 100 Mhz, 50 Mhz bus, 907



L50 - 125 Mhz, 50 Mhz bus, 954



L50 - 150 Mhz, 50 Mhz bus, 1096



L60 - 133 Mhz, 66 Mhz bus, 1110



***L70** - 120 Mhz, 60 Mhz bus, 1132



L70 - 166 Mhz, 66 Mhz bus, 1400



***L100** - 166 Mhz, 66 Mhz bus, 1418



L100 - 233 Mhz, 66 Mhz bus, 1856



Whetstone results

***L20** - 75 Mhz, 25 Mhz bus, 15



***L30** - 100 Mhz, 25 Mhz bus, 19



***L50** - 75 Mhz, 50 Mhz bus, 40



***L60** - 100 Mhz, 50 Mhz bus, 54



L50 - 125 Mhz, 50 Mhz bus, 64



***L70** - 120 Mhz, 60 Mhz bus, 68



L60 - 133 Mhz, 66 Mhz bus, 73



L50 - 150 Mhz, 50 Mhz bus, 80



***L100** - 166 Mhz, 66 Mhz bus, 97



L70 - 166 Mhz, 66 Mhz bus, 98



L100 - 233 Mhz, 66 Mhz bus, 135



Dhrystone results

***L20** - 75 Mhz, 25 Mhz bus, 47



***L30** - 100 Mhz, 25 Mhz bus, 49



***L50** - 75 Mhz, 50 Mhz bus, 132

***L60** - 100 Mhz, 50 Mhz bus, 171

L50 - 125 Mhz, 50 Mhz bus, 208

***L70** - 120 Mhz, 60 Mhz bus, 217

L60 - 133 Mhz, 66 Mhz bus, 226

L50 - 150 Mhz, 50 Mhz bus, 244

L70 - 166 Mhz, 66 Mhz bus, 284

***L100** - 166 Mhz, 66 Mhz bus, 301

L100 - 233 Mhz, 66 Mhz bus, 406

Norton results

***L20** - 75 Mhz, 25 Mhz bus, 6.6

***L30** - 100 Mhz, 25 Mhz bus, 8.0

***L50** - 75 Mhz, 50 Mhz bus, 14.1

***L60** - 100 Mhz, 50 Mhz bus, 15.7

L50 - 125 Mhz, 50 Mhz bus, 16.2

L50 - 150 Mhz, 50 Mhz bus, 17.1

L60 - 133 Mhz, 66 Mhz bus, 20.8

***L70** - 120 Mhz, 60 Mhz bus, 24.8

***L100** - 166 Mhz, 66 Mhz bus, 27.6

L70 - 166 Mhz, 66 Mhz bus, 30.4

L100 - 233 Mhz, 66 Mhz bus, 30.0

CPU Bench results

***L30** - 100 Mhz, 25 Mhz bus, 92.13


L30 - 133 Mhz, 33 Mhz bus, 125.63

L30 - 133 Mhz, 33 Mhz bus, write-back cache, 172.75


L30 - 160 Mhz, 40 Mhz bus, 203.23 (write-back cache?)

Norton SI results


*L50 - 75 Mhz, 50 Mhz bus, CPU speed - slowest, 9.3




L50 - 150 Mhz, 50 Mhz bus, CPU speed - slowest, 14.0



*L50 - 75 Mhz, 50 Mhz bus, CPU speed - max, 14.3



L50 - 150 Mhz, 50 Mhz bus, CPU speed - max, 17.7



Turbo95 v1.3 results

FPU speed

*L50 - 75 Mhz, 50 Mhz bus, 21.2 MFlops



L50 - 100 Mhz, 66 Mhz bus, 28.4 MFlops



Cache speed

*L50 - 75 Mhz, 50 Mhz bus, 72 MB/s



L50 - 100 Mhz, 66 Mhz bus, 98 MB/s



Display

*L50 - 75 Mhz, 50 Mhz bus, 21 FPS



L50 - 100 Mhz, 66 Mhz bus, 28 FPS



Disk

*L50 - 75 Mhz, 50 Mhz bus, 4.2 MB/s




L50 - 100 Mhz, 66 Mhz bus, 4.2 MB/s




Wintach 1.2 results

*L50 - 75 Mhz, 50 Mhz bus, 62




L50 - 100 Mhz, 66 Mhz bus, 104




ZDBench 97 results

Disk WinMark 97


*L50 - 75 Mhz, 50 Mhz bus, 258



L50 - 100 Mhz, 66 Mhz bus, 287




L70 - 120 Mhz, 60 Mhz bus, 438




CPUMark16


*L20 - 75 Mhz, 50 Mhz bus, 55.1




L20 - 100 Mhz, 33 Mhz bus, 74.5




*L30 - 100 Mhz, 25 Mhz bus, 64.7




*L50 - 75 Mhz, 50 Mhz bus, 134




L50 - 120 Mhz, 60 Mhz bus, 190



L50 - 150 Mhz, 50 Mhz bus, 208




L70 - 120 Mhz, 60 Mhz bus, 217




CPUMark32


*L20 - 75 Mhz, 50 Mhz bus, 57.4




L20 - 100 Mhz, 33 Mhz bus, 77.8




*L30 - 100 Mhz, 25 Mhz bus, 65.6




*L50 - 75 Mhz, 50 Mhz bus, 132




L50 - 100 Mhz, 66 Mhz bus, 174




L50 - 120 Mhz, 60 Mhz bus, 186



L50 - 150 Mhz, 50 Mhz bus, 200




L70 - 120 Mhz, 60 Mhz bus, 207




Business Graphics Winmark 97 (65k color depth)


*L20 - 75 Mhz, 50 Mhz bus, 6.88




L20 - 100 Mhz, 33 Mhz bus, 8.56




*L30 - 100 Mhz, 25 Mhz bus, 9.19




*L50 - 75 Mhz, 50 Mhz bus, 13.9




L50 - 120 Mhz, 60 Mhz bus, 22.4



L70 - 120 Mhz, 60 Mhz bus, 22.4



L50 - 150 Mhz, 50 Mhz bus, 23.4



Battery Life

Battery life will decrease as speed increases. You can expect a slight decrease in battery life of approximately 10-20%. You can increase the battery life in Pentium Librettos by running a program called CPUIDLE. This

program HALTS the CPU while its waiting for your input, and can lengthen battery life greatly (see my main page for link).

BATTMark

*L20 - 75 Mhz, 50 Mhz bus, 2:00

L20 - 100 Mhz, 33 Mhz bus, 1:44

*L30 - 100 Mhz, 25 Mhz bus, 2:00

*L50 - 75 Mhz, 50 Mhz bus, 1:37

L50 - 120 Mhz, 60 Mhz bus, 1:25

L50 - 150 Mhz, 50 Mhz bus, 1:21

*L70 - 120 Mhz, 60 Mhz bus, 1:29 (minimum power savings setting)

*L70 - 120 Mhz, 60 Mhz bus, 2:47 (maximum power savings setting)

The Future

Future Librettos may appear with the faster 233Mhz MMX Pentium, or the newer Pentium II chips. Toshiba has take the conservative route in using faster processors in their new designs, so we can expect an incremental increase in speed and performance in their next model.

(So far, Toshiba has released a new Libretto within six (6) months of the prior model. Thus, the next Libretto should be released some time in the summer of 1998.)

We've yet to see whether the latest L100 can be overclocked reliably, but the future bodes well for L100 owners.

Toshiba could release a flat battery to fit underneath the Libretto or move to lithium polymer battery technology, when available, to increase battery life. In the meantime, carry those spare high-capacity batteries, run CPUIDLE, and look into Xin's web site for his hand-made 8hr external battery pack.

Feedback

I hoped you enjoyed reading this article. Please send corrections and your experiences to my address below. Also, if you have detailed schematics and design notes from Toshiba on any Libretto, please forward them to me.

WARNING!!! PROCEED AT YOUR OWN RISK!!! YOU -CAN- EASILY DESTROY AND DAMAGE YOUR LIBRETTO BEYOND REPAIR!!! DO NOT USE OR FOLLOW THESE INSTRUCTIONS IF YOU ARE UNSURE, OR IF YOU DO NOT WANT TO TAKE THE RISK OF OVERCLOCKING YOUR MACHINE AND VOIDING YOUR WARRENTY!!!

[adorable toshibalibretto](#)

Overclocking the Libretto

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