



Motion J3500

MOTION LEAPS TO FRONT WITH CORE I7, CAPACITIVE DUAL TOUCH, GOBI2000, MORE

by Conrad H. Blickenstorfer; photography by Carol Cotton

On June 22, 2010, Motion Computing introduced the Motion J3500, a successor to the J3400 Tablet PC. Motion launched early 2009. The new tablet contains a good number of technology enhancements that clearly place the J3500 at the very forefront of full Windows power tablet technology. Thanks to a switch to Intel's latest ultra low voltage 2010 Core i5/i7 processors, the J3500 offers substantial performance improvements while remaining as, or more, power-efficient. Perhaps even more importantly, the availability of capacitive dual touch technology offers the potential shown by Apple's iPhone and iPad without giving up on the very precise electromagnetic digitizer technology often required in Motion's target markets. Add enhanced toughness via optional Gorilla glass and more flexible mobile broadband and GPS functionality via integrated Gobi2000, and Motion's claim of the J3500 being the "most advanced and feature-rich" tablet on the market seems entirely justified.

The Motion J3500: What's new?

What's new with the Motion Computing J3500 tablet compared to the predecessor J3400?

- Intel Core i5 or i7 technology with ultra-low voltage 1.06GHz Core i5 520UM or 1.2GHz Core i7 640UM processors provides significantly higher performance than the predecessor model.
- You can now get projected capacity multi touch in conjunction with the standard digitizer. Yes, that means swiping, dragging, two-finger pinching and rotating.
- It's the first major update to the Motion J3400 which was a brand-new design in early 2009.
- The machine now runs Windows 7 Professional (there is a Windows XP downgrade option).
- You can now get Gorilla glass that offers very high break resistance (albeit not available with the capacitive screen).
- You can get more storage (up to 160GB hard disk, up to 128GB SSD, up to 4GB RAM).
- Integrated auto-focus 3-megapixel documentation camera (up from 2mp) can take time/date and GPS-stamped documentation pictures.
- Integrated Gobi 2000 is available (includes GPS), supporting all major RF bands around the world in one chipset (see Gobi 2000 product sheet).
- The J3500 has IP52 sealing and can handle 3-foot drops.
- Pricing starts at US\$2,299, with our maxed-out configuration at US\$3,162.



Tablets — The big picture

While the new Motion J3500 may well be the best overall Windows-based tablet ever, the tablet market itself is at a crossroads. First introduced in the early 1990s with products such as the initial IBM ThinkPad and tablets from Toshiba, Fujitsu and many others, Tablet PCs didn't get a more or less unified platform until 2002 when Microsoft issued some tablet hardware guidelines and introduced the Tablet PC Edition of Windows XP. That's when Motion Computing introduced their initial tablet, and the company has been pursuing the tablet market with a combination of good business sense, laser-sharp focus on what matters in tablets, and great products that almost always offer the latest technology before anyone else.

Unfortunately, while Motion was quite successful with its tablets and focus on vertical markets, the Tablet PC as a category didn't fare quite as well. Hampered by only a half-hearted commitment to the tablet form factor (Microsoft itself redirected emphasis from tablets to notebook convertibles before the Tablet PC Edition was even released), high costs and the marginal suitability of Windows as a tablet OS relegated the Tablet PC to the sidelines. All of this has changed this year with the release of the Apple iPad, which sold over two million in its first few months, and triggered a tablet gold rush to market with dozens of iPad copies.

However, this time Microsoft may not be in the picture. Even with Windows 7's enhanced support of touch and inclusion of multi touch, full Windows simply isn't a tablet OS, at least not if what's desired is largely consumer-oriented iPad functionality. As is, future tablets may run the WebOS Hewlett Packard bagged with its acquisition of Palm, or Android, the eminently scalable smartphone OS currently doing battle with Apple's iOS. Analysts predict tablet sales in the tens of millions, and this time they just may be right with their crystal balls.

So these are the times Motion Computing faces at the introduction of its new flagship tablet. Unlike all the iPad wannabes out there, Motion's new machine is neither a concept nor an attempt at hedging the bets, nor a trial balloon to test the tablet market waters. Instead, it's the latest and technologically most sophisticated and advanced product from a



company that knows the tablet market better than anyone. As such, however, Motion's latest is not an industrial or more powerful version of the iPad, but remains a true blue Tablet PC, with the latest from Intel and the latest from Microsoft. Additionally armed with the latest display technology and the latest digitizer technology, this Motion machine is probably the culmination of the current Windows tablet paradigm.

That means the newest ultra low voltage Core processors from Intel, the fastest memory, the largest solid state disks, the incomparable Hydis AFFS+ display technology, and now even digitizer technology that effortlessly melds the fashionable multi touch with the tried-and-true Wacom digitizer. All of this comes in a handy 12.7 x 9.1 inch tablet that's not even an inch thick and weighs just four pounds flat, dual batteries included. There's a big wide-format 12.1-



inch screen and all the power of Windows 7 Professional. If that's what you need in a tablet, that's what you get with the J3500, and it currently doesn't get any better than this.

Intel Core i7 performance

When Motion Computing recently updated its C5/F5 tablets from an ultra low voltage Core 2 Duo processor (the U7500) to the Core i7 640UM, we found a roughly 2.2x overall performance increase. That's a dramatic difference that is immediately noticeable, and certainly an excellent argument both to select the F5v as well as upgrading from the earlier versions. The Motion J3400, however, already had an Intel processor exceptionally well suited for duty in a tablet in the 1.4GHz Core 2 Duo SU9400. In our initial review of the original J3400, we stated that this kind of performance puts the Motion J3400 at the very forefront of mobile computing technology, and certainly so among low-power, ultra-mobile designs. Can the J3500 top that? Motion thinks so and says it found a nearly 40% performance improvement in its own internal tests.



Why does Motion expect such a big performance increase when the old processor ran at 1.4GHz and the new ones only at 1.06 and 1.2GHz? That's because while in the past, new Intel processors did not always deliver the promised performance boosts, the new Core processors do, and are truly remarkable designs. Here's what happened: After several years of Core Duos and Core 2 Duos, in early 2010, a new generation of Intel Core processors was released to provide better performance, better integration, newer technology, and higher efficiency. The new Core i3, Core i5 and Core i7 processors by and large represent Intel's "good," "better," and "best" processor solutions in any given category. It gets a bit confusing as the new processors come in numerous versions at different speeds and including different technologies. Core i3 processors, for example, do not have the new Intel "Turbo Boost" feature that provides extra perform-

ance via automatic overclocking. Core i7 processors generally have more cache and support more special Intel features than Core i5 and Core i3 processors. Also, as a first in this class of Intel processors, the memory controller and fairly powerful integrated graphics with HD hardware acceleration are now part of many of the processors, and there are new and more powerful companion chipsets.

Looking at the specs, however, would lead one to believe that whatever power gains were made would come at a severe cost in battery life. That's because while the SU9400 processor had a thermal design power rating of 10 watts, both new processors used in the J3500 have a TDP of 18 watts, even though they are considered ultra low voltage. Thermal Design power is defined as the maximum amount of power the cooling system in a computer is required to dissipate, and it's often used as an approximate indicator for performance.

To find out, we ran Passmark Software's PerformanceTest 6.1 that runs about 30 tests covering CPU, 2D graphics, 3D graphics, memory, and disk and then computes scores for each category and an overall PassMark score. For comparison, we're listing the predecessor Motion J3400 and also both the original and the latest version of Motion's F5 semi-rugged tablet computer. This shows not only how the J3500 compares to the F5v, but also by how much the latest versions improved over their respective predecessors.

As we expected based on our experience with these processors, the new J3500 is indeed quite a bit quicker than the J3400. In the overall PassMark benchmark we saw an improvement of about 24%, whereas the overall CrystalMark index is 67% higher. This means that RuggedPCReview.com's performance benchmark testing confirms Motion's assertion of a nearly 40% performance improvement. The improvement between the J3400 and J3500 is not as drastic as that between the original Motion F5 and the latest F5v, but that's to be expected given the J3400's more recent and modern underpinnings.

Note that benchmark results are never without surprises. For example, the two benchmarks do not agree on sheer computation power where CrystalMark greatly favors the new Core i7 chip whereas Passmark actually has the older SU9400 chip ahead. The situation is quite clear in the memory benchmarks where the newer design has a definite advantage. Somewhat unexpected was the much improved

disk benchmark as both the older and the new test units had SSDs. On the graphics side there is substantial improvement as well, probably thanks to the memory controller and integrated graphics with HD hardware acceleration. Graphics performance still does not come close to that provided by discrete graphics sub systems, but it is definitely faster than before.

We also ran the "Windows Experience Index" that Microsoft includes in Windows 7 as an indicator of a computer's performance and got the following scores (for comparison we also included the scores of an older Motion LE1700):

WINDOWS EXPERIENCE INDEX

Model	J3500	J3400	LE1700	
Processor	5.7	4.6	4.3	(Calcs per second)
Memory (RAM)	5.5	4.9	4.2	(Memory ops/second)
Graphics	3.5	3.2	3.3	(Aero interface)
Gaming Graphics	3.6	3.3	3.1	(3D graphics)
Primary hard disk	6.9	5.9	5.3	(Data transfer rate)

Battery power: a frugal machine

Battery life is another area where competition is getting ever more intense. Two or three hours used to be considered quite good. The J3400/J3500's predecessor, the LE1700, was expected to get about three hours between charges. However, between advancing battery technology, more efficient processors, and better power management, three hours was no longer good enough and many mobile systems now sport battery lives of six to eight hours and more. As a result, Motion, too, sought to increase battery life in its new machine.



The total battery capacity of the J3500 remains unchanged; That's provided via dual hot-swappable 14.8V/2,000mAh Li-Ion batteries fitting into the bottom of the machine where they become part of the design. The batteries have an external push button that instantly shows, via 5 LEDs, how much charge is left. One word about the hot-swappable aspect. In the J3500 it means you can take out one battery and replace it with a fresh one; you cannot take out both at once. And if you only use one battery, it is not hot-swappable. We'd have liked to see a true hot-swap feature as in the new Motion F5v where an internal backup battery gives you about a minute to replace the spent battery with a freshly charged one.

As was the case with the predecessor J3400, our BatteryMon power drawdown tester was unable to measure battery draw. The program, however, did compute estimated battery life based on remaining charge compared to full charge and we saw as much as seven hours. This was with WiFi on and the system idling along. During a typical day, power savings modes will make the system go to sleep and wake up again when the computer is being used, and that works much better in Windows 7 than in Vista or XP. While in sleep mode, the power consumption is

PERFORMANCE	Motion J3500	Motion J3400	Motion F5v	Motion F5
Processor	Core i7-640UM	Core 2 Duo SU9400	Core i7-640UM	Core Solo U1400
Clock speed	1.2 GHz	1.4 GHz	1.2 GHz	1.2 GHz
Thermal Design Power	18 watts	10 watts	18 watts	5.5 watts
CPU Mark	699.2	834.9	781.4	324.9
2D Graphics Mark	181.5	172.9	184.6	153.8
Memory Mark	502.5	347.1	496.1	235.1
Disk Mark	1004.6	552.5	1040.2	168.8
3D Graphics Mark	276.1	105.3	256.3	75.6
Overall PassMark	538.6	435.2	564.9	194.4
ALU	23,294	13,632	23,147	4,565
FPU	21,721	12,991	23,596	5,343
MEM	17,025	9,929	16,552	4,989
HDD	28,029	16,418	24,780	3,252
GDI	6,862	4,847	6,978	4,239
D2D	1,416	1,003	1,492	4,221
OGL	1,694	1,061	1,617	1,1151
Overall CrystalMark 100,041	59,881	98,162	27,760	

extremely low, and greatly extends battery life. This makes an exact estimate of real life battery life more difficult as a typical machine will not be used continuously.

We also connected the J3500 to a Kill-a-Watt electricity usage monitor with both batteries removed and, with the J3500 set to power conservation mode, we saw a minimum draw of about 11 watts. That's two watts lower than what we observed on the J3400. And it's about the same as the 10.9 watts we observed via BatteryMon on our review Motion F5v, which makes sense. Given the 60 watt-hour capacity, the 11 watt draw would indicate about 5.5 hours of battery life.

Capacitive dual touch now available!

The Motion J3500 has capacitive dual touch! Ever since the iPhone, and now the iPad, capacitive multi touch has become the Holy Grail of touch interfaces, with everyone aiming to duplicate the effortlessly elegant implementation in Apple's products. That is not easy, but capacitive touch on the J3500 definitely works much better than on any other Windows-based machine I've tried so far. How did Motion do it? A tap on the "About" button in the J3500's Touch Settings control panel said "Touch Driver v3.2.1-1 Wacom Co. Ltd., 2007-2010." So there. Wacom. Now Wacom's been the undisputed leader in electromagnetic digitizers pretty much since the dawn of tablets and digitizers, but the company had struggled with capacitive digitizers, and especially something that would integrate with their electromagnetic digitizer. In 2007, Wacom bought Austin, Texas-based TouchKO, a company that had specialized in surface capacity touchscreens, an interesting technology, but one that cannot do multi touch.

If you dig deeper into Wacom's website, you also find a technology page on RRFC (Reversing Ramped Field Capacitive) touch technology. The technology was said to allow combination with Wacom's EMR digitizer for a true dual-mode input solution. RRFC apparently used four separate electrostatic fields (as opposed to the single field in standard surface capacitive designs). However, a check with Motion indicated that they did not use RRFC but Wacom's "gen 6 P-Cap multi touch technology" instead.

Now PCAP simply stands for projected capacity and there doesn't seem to be any further information on the technology Wacom used here. In general, projected capacitive is a good step up from the simpler surface capacitive screens as projected technology uses an x-y grid that's usually etched into the conductive layer.

So here's the scoop on what capacitive touch on the J3500 can do and what it can't (and the video to the right provides a demonstration).

When you check the Touch Settings control panel, it says "Two Finger Touch Device" and that is what the technology appears to be set up to do. You can use either one finger or two, but not three or more. That is technically multi touch, and it's what the iPhone and the iPad do. They also only acknowledge two fingers, and that's how all the magic is done.

On the Motion J3500, you can, for example, draw two simultaneous lines in Microsoft's simple Paint application. You can drag and whirl two images in Microsoft's Collage demo program, and you can use two fingers in Microsoft Surface Globe. It all works remarkably well, and actually much better than in any other PC-based multi touch system we tested.

However, this is, of course, still Windows, and so there are applications where multi touch works and others where it doesn't.

In the Windows Photo Viewer, for example, you can pinch and expand to zoom in and out, and you can also rotate pictures in 90 degree increments. However, in Google Earth, which would be a natural for multi touch, none of the two-finger gestures work and you have to resort to old-fashioned tapping on controls.

How do touch and pen work together? Very well. In essence, as soon as the tablet senses the pen, it stops responding to touch. When it no longer senses the presence of the pen, touch instantly returns. This way, you can operate the tablet in touch mode, and then simply use the pen for actions and software that require precise manipulation. The control panel also lets you set the system so that a double-tap toggles between pen only and touch only modes

Fantastic display

The Motion J3500's display uses the 16-to-10 "wide-format" aspect ratio that has largely replaced the old "standard" 4-to-3 aspect ratio displays (albeit not in the trend-setting iPad). The shift to wide displays may be due to computers following the trend set by television sets where a wide screen is better able to display movies that are almost always in wide format. The 12.1-inch display Motion chose is made by Hydis Technologies, which pioneered AFFS (Advanced Fringe Field Technology) displays that offer a full 180-degree viewing angle from all directions. The LCD in the J3500 uses AFFS+, an evolutionary advance to AFFS that lowers power consumption and increases outdoor readability. It has a resolution of 1280 x 800 pixel and uses an LED backlight. Brightness is 320 nits, but thanks to the AFFS+ technology you'd swear it was more than that. Since the display essentially uses transmissive technology with certain transreflective features, the screen is bright and crisp indoors while being amazingly vibrant and readable outdoors.



In everyday use, the J3500 display's outdoor performance is excellent. The perfect viewing angle from all directions means you never have to tilt and angle the tablet to see what's on the screen. The display itself excels in eliminating unwanted reflection or diffusion. Where other displays appear matte or milky or are overcome with reflections, the J3500's stays perfectly readable. In head-on, direct sunlight the display is still readable, here thanks to the inner reflectance of the Hydis LCD.

How does it all work? Hydis claims that the reflective polarizer used in AFFS+ displays lowers surface reflectance and minimizes screen scattering. They claim a screen reflectance of under 0.3% (and here I assume the value supplied by Hydis means total reflectance of all surfaces). Given that the effective contrast ratio of an LCD used outdoors is computed

as $1 + (\text{emitted light} / \text{reflected light})$ and that average sunlight is about 10,000 nits, the J3500 screen has an effective contrast ratio of $1 + (320 / >.003 \times 10,000) = 1 + >10.66 = >11.66$. On our scale that means "definitely readable in sunlight" and subjective viewing tests confirm that.

The J3500 display also seems to have fixed the predecessor J3400 display's tendency to attract fingerprints and other smudges like a magnet. The new display seems almost immune to it.

While detailed specifications help in determining how easy it is to view and use a display outdoors, you won't know how good it is until you take it outdoors into the sunlight. It also helps to have a point of reference, in this case other displays to compare to. We felt it would be interesting to see how the Motion J3500 compared to two types of displays common these days—an example of a high gloss screen that most current consumer and business notebooks have these days, and a sample of a "matte" display with anti-glare treatment. The comparison machines we chose are a Gateway notebook we use around the office and a Toshiba Portege M700 Tablet PC convertible, predecessor to the still available Portege M780, and beneficiary of almost two decades of Toshiba pen computing experience.

The 2006-vintage Gateway does not specifically have an outdoor screen but despite its glossy screen, a degree of anti-reflective treatment makes it useful enough to be taken along on trips.

The picture below shows the Gateway and the J3500 in the shade on a bright, sunny day, facing away from the sun. Both displays are bright and readable in this outdoor setting, and even though the Gateway screen is glossy, from this angle there are few reflections. The J3500's somewhat brighter backlight is clearly noticeable.



The next picture shows the computers in bright daylight from an angle. Here, the Gateway's glossy display becomes totally mirror-like and unreadable. In contrast, the J3500 screen has no problems at all.



Toshiba took a different approach and used a matte display with anti-glare coating. This works under many circumstances, but not in strong daylight where the anti-glare treatment simply diffuses the light, making the display milky and unreadable. The J3500's AFFS+ display remains very readable.

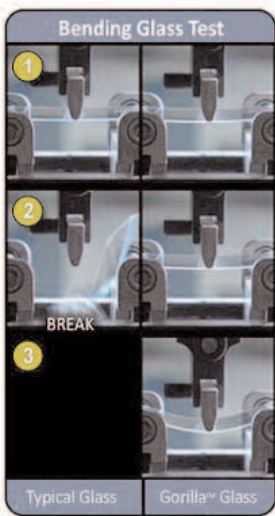


Direct sunlight is always the toughest test because no amount of backlight is a match for the sun. Readability then relies on how well the LCD can reduce the amount of day/sunlight reflected from its various surfaces. The less daylight reflected, the higher the ratio between backlight and reflected daylight, and the more readable the display remains. Clearly, the J3500 does as good a job as can be done.



Gorilla glass: 4x break resistance

In October 2009, Motion began offering Corning's somewhat funkily named "Gorilla glass" as an option with its C5 and F5 tablets, and it's now available with the J3500 as well. What is Gorilla glass?



According to Motion, it is "thin-sheet glass that was designed to protect against real-world events that cause display damage." Examine some of the video on Corning's Gorilla Glass page, and you see the glass being bent and steel balls falling onto it. The glass neither shatters nor breaks. In fact, it's hard to

believe it's glass at all. It looks more like a very thin sheet of some polycarbonate plastic or acrylic. But it is glass.

The secret, according to Corning's Dr. Shashidhar with whom I had the pleasure of talking with on the phone about Gorilla glass, lies in a special chemical ion-exchange strengthening process that results in what Corning calls a "compression layer" on the surface of the glass. The primary purpose of that layer is to act as an armor that guards against the nicks and tiny cracks that then result in the glass breaking. And even if there are tiny nicks, the layer keeps them from propagating.

Gorilla Glass adds peace of mind because you just know it won't break. And Gorilla Glass has another benefit that may turn out to be quite a selling point for Motion: it's nearly immune to smudges. There's nothing worse than a display that's full of grime and fingerprints, and that just doesn't seem to be an issue with Gorilla Glass.

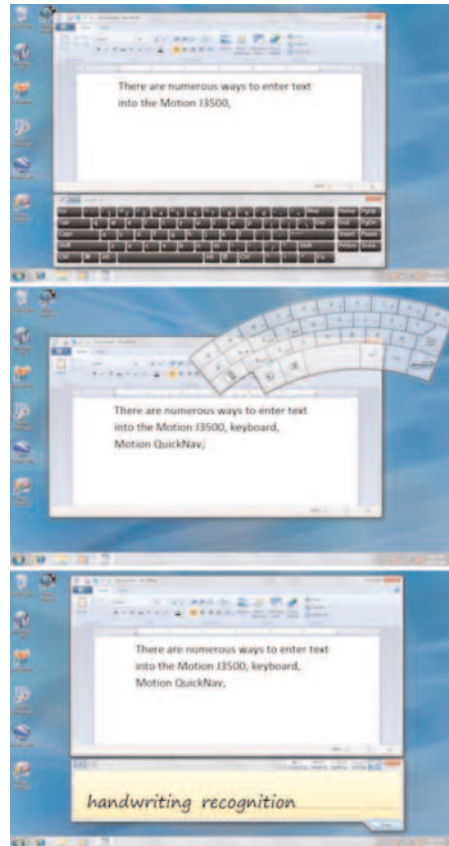
Unfortunately, you can't combine the Gorilla glass option with the capacitive digitizer. It's either one or the other. That's because capacitive technology requires direct touch, and the protective Gorilla glass would make that impossible.

Data input methods

The Motion J3500 is very flexible when it comes to data entry. It can be used with any external USB keyboard or with its innovative keyboard/stand

combo. There are times, however, when you carry the tablet around and there is no physical keyboard present. That's when users rely on alternate data entry methods. Tablet computers usually offer various methods, and Motion made available a variety of onscreen data entry methods as well as customization options.

Windows 7 continues to offer the standard Microsoft input panel that can be used as an onscreen keyboard (see top screen in the picture below) or for free-form (or character-by-character) handwriting. The Microsoft keyboard can now be resized to any size, and is much better than in the past.



Motion's QuickNav utility adds a handy numeric input pad along the right side of the display. QuickNav lets you switch from the keypad to the standard horizontal keyboard to an ergonomically designed, rounded layout (see middle screen in the image above) that works well with the pen. It can be moved around, minimized into an icon, but not resized.

The bottom screen capture to the right shows Microsoft WordPad with handwriting recognition. While handwriting recognition was intended to be an integral part in the original pen computers of the early 1990s, the challenge of making recognition work in real world situations proved daunting. Recognition, however, is still there and under Windows 7 works better than ever, with new handy new editing tools. J3500 users should learn how to use it and give it a chance.

There was a time when the Microsoft recognizer let you write all over the screen. That feature was dropped several years ago, and instead, you now need to write into the input panel. Ink goes on very smoothly and without jaggies, and without any of the lag that still hampered the J3400 with Vista. Most Windows software, of course, was never meant to be

used with handwriting recognition and is not optimized for it, but recognition itself works very well on the J3500. And that includes punctuation and editing.

QuickNav also includes an image capture feature that can also do time and GPS stamps if the J3500 has GPS. A GPS Locator feature snatches GPS information that you can then easily include into documents such as surveying notes or anything else that uses GPS tracking.

QuickNav keys can be customized any which way you want. It's a neat utility that'd be even better if there'd be floating notations of what a key does (there are enough to make it hard to remember everything).

Integrated documentation camera

Many of the Motion J3500's intended applications can benefit from comprehensive, integrated documentation, and the tablet therefore has a built-in camera that can snap pictures as large as 2048 x 1536 pixel. That's 3-megapixel instead of the 2-megapixel of the J3400. The lens is embedded in the bottom of the unit, so it is clearly meant to record pictures, situations and movies as opposed to enabling video conferencing. Cameras integrated into computers don't have the best reputation for sharpness or speed, and while the new 3-megapixel camera has pretty quick autofocus and a nice LED illuminator for shooting in low-light conditions, it remains lightyears behind even basic dedicated digital cameras. Why that is is beyond me. There are tiny CCD and CMOS assemblies with autofocus that can take hi-res pictures and glorious 1080p HD video, and why that is not available even in top-notch computer hardware such as the J3500 is odd.

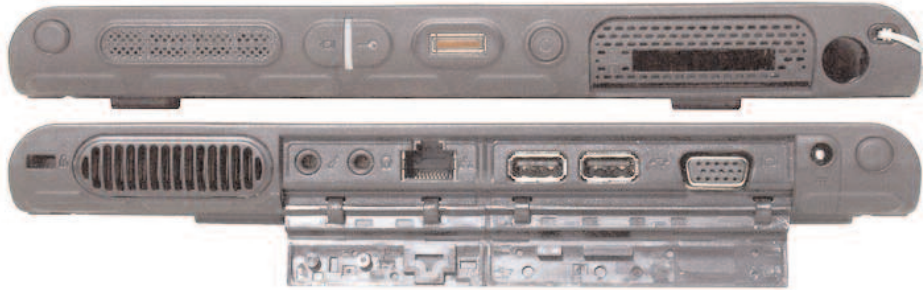
The J3500 comes with an interesting (albeit difficult to figure out) "Picture Snapper" interface that is embedded in the QuickNav utility and has the ability to add time/date stamping and geotagging information to images. The picture to the right shows the Picture Snapper in a potential application: Assume that an inspector needs to document label data and safety stickers on compressor units. They could then use the J3500 to take a close-up of the systems and QuickNav would automatically add a date and time stamp as well as full GPS data. Talk about comprehensive documentation! The potential for this kind of information via integration of onboard functionality is tremendous.



Note that many system integrators and software developers will probably integrate camera and GPS tagging functionality into custom applications.

Interface and connectivity

Unlike ultra-rugged slate computers that often have almost no onboard connectivity due to sealing requirements, Motion has always offered plenty of interface ports on its machines, and the J3500 is no



different. There are two USB 2.0 ports, audio in/out jacks, an external video port, an RJ-45 jack for the integrated 10/100/1000 gigabit LAN, and a docking connector. There are two speakers as well as Motion's terrific multi-directional array microphone design that intelligently switches between two of its three microphones depending on screen orientation (which can be set to happen automatically via accelerometer). There is no DVI-D port (but you get one in the optional FlexDock) or Motion accessory port. Above you can see the left and right side of the J3500.



For expansion, the J3500 has a single Express Card 34 slot and an optional Smart Card slot. With space at a premium and both USB and Express Card SD adapters, Motion decided to forego a separate SD slot. A SIM card slot can be found under one of the batteries.

For communications, there is a Centrino Ultimate-N 6300 802.11a/b/g/n WiFi module and Bluetooth 2.1 + EDR. Optionally available is Mobile Broadband powered by Gobi, now in the form of the Gobi2000 module. Gobi (Global Mobile Internet technology) is a Qualcomm wireless technology that supports the various wireless networking technologies around the world, so users can select whatever carrier is available to them.

Recessed hardware controls (including a PDA-size navigation pad) with embossed symbolic labels are tiny and require a firm touch to operate.

Ruggedness

A degree of ruggedness has pretty much become a requirement in computers being used in the field. Vertical market customers abhor the high failure rates of consumer notebooks and the productivity loss incurred by equipment downtime even after minor accidents.

As a result, tablets like the J3500 are now expected to absorb a degree of abuse and the kind of accidents typical for their intended use and working environment. That means the J3500 should be able to survive a fall from the seat of a vehicle, a drop to the ground

while being carried, and getting rained on a bit.

As is, the Motion J3500 tablet is sealed to IP52 specifications. That means it keeps dust from getting inside the computer and can also handle water spray falling onto the device. As far as temperature goes, the recommended operating range is 41 to 113 degrees Fahrenheit. Units also can handle 8-80% non-condensing humidity, and altitudes of up to 15,000 feet with SSD and 10,000 feet with a hard disk. While Motion said the predecessor J3400 could handle a 36-inch drop to plywood over concrete, no such claim is listed in the J3500's specs. An oversight?

Design hasn't changed, and there's still an elastomer overmolded bottom case that cushions shock, seals seams, and insulates for a cool, non-slip grip. Inside is a rigid magnesium frame that makes for a strong, solid base for mounting and attaching components, using replaceable strap mounts where it matters. The design philosophy here is to use strength where it matters, and "give" where that's a better approach. A "floating" foam mount for the LCD avoids stress, and despite the J3500's slender design, there is enough space to allow some flexing instead of transmitting blunt force to the rigid frame.

Also inherited from the J3400 are a number of intelligent details. The two batteries, for example, have molded elastomer "lips" along the perimeter to keep water out. Microphones and speakers are protected from water with special water-sealing membranes that do not affect functionality. Special elastomer guards behind the hardware buttons also seal against water.

This "strength and give" approach to design is carried on down to components. The ExpressCard expansion bay, for example, is attached to the magnesium frame via replaceable, shock-absorbing flex-mounts.

Keyboard/stand and FlexDock

The J3500's very thin keyboard/stand has the same design and uses the same materials as the tablet, so it definitely looks like it belongs to the machine. The keyboard opens to reveal the keys and a stand.

The QWERTY part of the keyboard is 94%-scale, which makes for a slightly cramped feeling that can throw off touch-typists. The distance between the center of the letter "Q" on the left and the letter "P" on the right is 6.75 inches on a full-scale keyboard. Here the distance is only 6.375 inches. That could have been fixed by making the punctuation keys a bit narrower, the same way the keyboard's designers made the period and comma keys a bit narrower in order to have an ergonomically correct navigation diamond. Not making the QWERTY part of smaller keyboards wide enough is something I often find on mobile keyboards, and I cannot explain in any other way than assuming Asian language designers (who use an entirely different input method where touch-

Motion J3500 Specs

Type: Semi-rugged Tablet PC slate

Housing: Magnesium chassis; PC+ABS exterior with elastomer overmold bottom case

Processor: Intel Core i7 640UM 1.20GHz, max Turbo Boost 2.266GHz, 4MB L3 "smart" cache, or Intel Core i5 520UM 1.06GHz, max Turbo Boost 1.866GHz, 3MB L3 "smart" cache, 18 watt Thermal Design Power

OS: Windows 7 (XP Tablet PC Edition available via downgrade from Windows 7 or Vista)

Memory: 3GB DDR3/800MHz in two DIMM slots; upgradeable to 4GB

Slots: 1 Express Card 34, 1 Smart Card, 1 SIM

Display: 12.1" 1280 x 800 pixel LED-backlit TN or Hydis WXGA sunlight-viewable AFFS+ TFT with 180 degree viewing angle and View Anywhere display technology

Digitizer: AFFS+ with dual input (capacitive touch and electromagnetic Wacom); Standard TN with dual input (capacitive touch and electromagnetic Wacom); AFFS+ with Gorilla glass and electromagnetic Wacom

Keyboard: Onscreen keyboard + optional J3500 82-key 94%-scale Mobile Keyboard/Stand

Storage: 64 or 128GB Solid State Disk; also available 1.8-inch 5400RPM 160GB SATA hard disk

Size: 12.7 x 9.1 x 0.9 inches

Weight: 4.2 pounds (as tested, with both batteries)

Ingress protection: IP52 (protected against dust; can handle water spray onto surface +/- 15 degrees)

Operating temperature: 41 to 113 degrees Fahrenheit operating

Regulatory: AS/NZS 3548:1995 Class B; AS/NZS 4771 and 4268; AS/ACIF S042.1 (WCDMA/HSDPA) or S042.3 (GSM/EDGE); CAN/CSA ICES-003 Class B; CAN/CSA RSS-210 Issue 7; CAN/CSA RSS-132 (1xRTT/EVD00/EVDOA) and RSS-133 (1xRTT/EVD00/EVDOA); CENELEC EN 55011 (CISPR11); CENELEC EN 55022 Class B (CISPR22); CENELEC EN 55024 (CISPR24); CENELEC EN 61000-3-2, 61000-3-3; ETSI EN 301-893, 300-328, 301-489-1, 301-489-3, 301-489-7, 301-489-17, 301-489-2, 300-330, 301-511, 301-908; FCC Part 15 Subpart B Class B, Subpart C (2.4Ghz), Subpart E (5Ghz); FCC Part 22 H (1xRTT/EVD00/EVDOA), FCC Part 24 E (1xRTT/EVD00/EVDOA), R&TTE (89/336/EEC) & R&TTE (99/5/EC)

Safety: UL, CUL, ULGS (EN/IEC 60950-1 A11/2004); EU Directive 2002/95/EC and 96/EC; California Prop. 65; IATA Lithium regulation AS/NZS 3260:1997, 60950-1 (1st & 2nd Edition); FCC/ANSI C63.41; UL, CUL, CE (IEC/EN60950-1 A11/2009); IEC/EN 60950-1 2nd Edition (2005); CAN/CSA RSS-102; FCC OET65 Supplement C; ETSI EN 50392; LVD (73/23/EEC); EU Directive 2002/95/EC, 2002/96/EC, 2006/66/EC and amendments; California Proposition 65; Technical Instructions for Safe Transport of Dangerous Goods by Air (ICAO Doc #9284); Emergency Response Guidance for Aircraft incidents involving Dangerous Goods (ICAO Doc #9481)

Power: Twin 30 Watt-Hour Li-Ion (14.8V, 2,000Ah each), "~7 hours"

Communication: Intel Centrino Ultimate-N 6300 (802.11 a/b/g/n), Bluetooth 2.1 + EDR; optional Mobile Broadband and GPS (GOBI 2000)

Interface: Fingerprint scanner, 2 USB 2.0, audio in/out, 3 microphones, 2 speakers, VGA video, RJ-45 gigabit, dock (4 USB, DVI-D, audio in/out, display, RJ45), optional 3-megapixel camera with illuminator

Price: Starting at US\$2,299 (our review configuration with 4GB RAM, 128GB SSD and capacitive dual-touch is US\$3,162)

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typing does not matter) don't realize how important 100%-scale of the QWERTY part is to Westerners.

Thin keyboards are often difficult to type on because they offer little tactile feedback or feel flimsy. The Motion keyboard works better than most. One interesting aspect is that the keyboard has a very thin, form-fitting translucent protective rubber skin over it. It doesn't affect typing at all and provides



protection. The skin is glued on along the top and bottom but open on the left and right and it looks like you can just take it off (which I probably would).

You can't adjust the angle of the stand. Thanks to the superb display with its 180-degree viewing angle and total lack of any color shifts, that is not an issue. The keyboard has a built-in standard touchpad with left and right mouse buttons. They work great and

then be rotated from vertical to about a 45 degree angle. There is a charging slot for a battery and the FlexDock also provides extra connectivity.

Neatly tucked away under a plastic cover in the back are four USB ports, a DVI-D port, audio in/out, an RJ45 LAN jack, and a display port. The dock runs US\$299 and is well worth it for those who intend to frequently use the J3500 in an office setting.

are very responsive. Motion also offers a FlexDock that essentially converts the J3500 into a full-featured desktop computing solution (see picture above to the right). The FlexDock consists of an elegant, heavy metal base and a plastic docking part that continues the look, materials and design theme of the J3500. The tablet snaps onto the FlexDock and can

Motion Computing Motion J3500: Summary

The J3500 from Motion Computing is a sleek, slender full-featured, full-power tablet computer that has taken a major step forward in terms of computing power and usability.

An approximately 40% overall performance increase compared to the predecessor model comes courtesy of an ultra low voltage Intel Core i7 processor that incurs no penalty in battery life. In fact, between the very efficient processor design and Windows 7's excellent power management, the J3500 can well meet Motion's 7-hour estimate.

A substantial functionality increase comes via Motion's new capacitive dual touch technology that combines projected capacitive multi touch for effortless swiping, pinching and rotating, with a standard electromagnetic Wacom pen digitizer for precision work. Switching between the two is automatic, and the system is a pleasure to use.



The J3500's 12.1" wide-format display is among the very best, with a perfect 180 degree viewing angle from all directions, and excellent indoor as well as outdoor performance. The display surface is also much less smudge-prone than before. Virtually unbreakable "Gorilla" glass is available as an option, though not in conjunction with the capacitive digitizer.

The new model also benefits from the availability of more RAM and larger disks, both of the rotating and solid state variety. The J3500 also has an integrated biometric fingerprint sensor, a 3-megapixel integrated camera with auto focus, an optional Gobi2000 wireless broadband module and GPS, a very good convertible keyboard, good onboard connectivity and expansion, Motion's Speak Anywhere multi-directional array microphones with their excellent noise cancellation technology, and a SIM card slot.

With the addition of the new Intel Core processors and very functional capacitive multi touch, Motion Computing now offers an advanced tablet platform for those who need full Windows 7 functionality but also wish to explore the effortless elegance and potential productivity enhancements of a multi touch interface.