Taking a look at the SR820

Unlike some of the rugged UMPCs we’ve reviewed, the RUGGEDBOOK SR820, compact though it is, doesn’t look like a scaled-down computer. It measures 10.1 x 6.2 inches and is an inch and a half thick. Its nine-inch touch screen looks large enough. And unlike some lightweight tablets, it has a full set of I/O ports, and they are all full size. It also runs the full version of the Windows XP Tablet PC Edition.

The design is purposeful but not fancy. No chrome or style elements here. The SR820 is just a matte-black magnesium tablet with rubber bumpers on each corner for additional protection. There is no keypad and there are no hardware controls other than a number of large and very clearly marked membrane pushbuttons along the right side of the display.

Looking at the computer from all sides, there are ports underneath individual protective rubber plugs on the left and right (the red window indicates the optional laser scanner), and a surface-mount docking connector at the bottom. There are two additional cutouts each on top and on the bottom of the unit. They accommodate antennas and additional expansion.

Design and construction

While the RUGGEDBOOK SR820 may look like just a tablet version of a standard netbook, it looks deceiving. The SR820 is far better built than any consumer netbook, and it is far tougher and more durable. The device feels as if it were crafted from a solid block of metal, and there is no flexing or twisting at all.

Unlike the often very intricate housing/chassis constructions found in consumer tablets and notebooks, the supremely solid magnesium alloy case of the SR820 consists of just a lower box with the LCD lid on top of it, held together by ten long screws. Sealing consists of a rubber O-ring sitting in a groove around the entire perimeter. It is not actually a ring, but a length of rubber, that terminates with a sort of side-truck.

There are two removable covers on the backside of the RUGGEDBOOK SR820 (both removed in the picture above). One covers the battery and expansion slots, the other the optional WiFi module.

The battery compartment is protected by a flat metal plate secured with four Philips screws. The battery itself is a rectangular block. Its capacity is 38 watt-hours (7.4 Volts, 5,200mAH). The battery contacts are not sealed towards the interior of the computer, so all sealing must be via the cover plate. To accomplish this, there is a flat ribbon O-ring seal held in place with a series of tiny pins. For proper sealing it’s imperative that the seal, which is a bit of dust and lint magnet, is in place and not compromised in any way. In fact, the seal must be carefully put in place after the battery has been inserted.

Inside the SR820, the Samwell-labeled mother-
board is extremely clean. It is a one-piece solution with a separate I/O board that, in our system, included a VGA port, a USB port and a laser scanner.

Samwell offers two different I/O configurations. One adds a standard DB-9 RS232 serial port, the other replaces that port with the window for the optional Symbol laser scanner. Our test had:

- 2 USB 2.0
- 1 VGA RJ45 + 2 audio jacks
- 1 RJ45 LAN
- 2 audio jacks
- Laser scanner
- Docking/port replicator connector

The optional dock adds three USB ports, a RS232 serial port, a LAN port, and DC power. The dock attaches to the bottom of the unit and also provides vehicle mounting options. The image below shows the SR820 in the dock, here shown with RAM’s patented ball and socket mounting system that allows you to mount practically anything anywhere.

For expansion, the battery compartment also contains an SD Card slot and a SIM slot for use with the optional WWAN module. Having the SD Card slot inside the unit, and under a screw-down door, means the card is safe, but it is not readily accessible.

One concern I have is that the I/O ports completely rely on the protective rubber plugs for sealing, i.e. the connectors behind the protective plugs do not have additional sealing. The plugs fit well and are replaceable, but you have to firmly push them in place to get a reliable seal, and that is not easy when you wear gloves or when it’s cold on the job.

**Ruggedness**

As the brand name implies, the RUGGEDBOOK SR820 is fully rugged. Its magnesium construction feels like it is made to last, and it can take quite a beating. Its inherent toughness is enhanced by rubber bumpers on all corners that are actually steel caps with rubber on top. This makes them far more stable than rubber-only bumpers, and they securely attach to the unit without the need of glue. The picture to the right shows one of the bumpers.

Samwell performed a variety of MIL-STD 810F/885G testing, both in-house and through SGS Group external testing. The SR820 passed the MIL-STD 810G Method 516.6 Procedure VI “Drop test” that includes 26 drops to concrete on each face, edge and corner from 48 inches. It also passed mechanical shock, random vibration, temperature/humidity cycling as well as high/low temperature tests.

As far as sealing against the elements goes, the SR820 carries IP66 ingress protection where the “6” means the unit is totally protected against dust, and the “5” means the machine is protected against low pressure water jets from all directions, although limited ingress is permitted. The standard operating temperature range is 41 to 122 degrees Fahrenheit for hard disk versions, and 32 to 140 degrees Fahrenheit for systems equipped with a solid state drive (SSD). There is no low temperature option that would allow operation in freezers and similar deployments.

The pictures below show some of the independent ruggedness testing performed at SGS Group labs.

**Powered by Intel Atom**

The RUGGEDBOOK SR820 is based on Intel’s Atom processor architecture. Intel introduced the Atom platform a couple of years ago as an optimized solution for devices that did not require Intel Core processor performance or simply needed a processor solution that generated less heat and used less power. Intel met its goals, and Atom processors have been hugely popular and a hit for Intel, with millions of Atom-powered netbooks sold, and the chip being used in a growing number of vertical market devices.

So let’s take a look at Atom’s background.

In an attempt at fending off criticism over its mediocre mobile processor offerings, Intel’s goals for the Atom were low power consumption and low cost while still delivering adequate (or, as is often used, “targeted”) performance. To achieve that, the Atom platform was an entirely new design that allowed Atom chips to use much less power than even the slowed-down ultra-low voltage mobile versions of Intel’s Core processors. There are trade-offs, of course. In order to preserve power and keep costs down, most Atom chips only have one core and instead use HyperThreading, an older Intel technique that uses two threads without increasing power consumption.

Atom processor architecture is fairly simple (if any processor with its millions of transistors can be called simple) but includes a lot of power conserving features. A special bus mode minimizes power needed to transmit data to the processor. During periods of inactivity, cache is flushing cache data to system memory. Other Intel power conservation modes were improved and a new standby mode can essentially shut down the processor. Combined, these measures can result in greatly reduced overall power draw while still providing acceptable performance.

The ZS30P used in the SR820 is part of the original ZSox family of Atom processors, codenamed “Silverthorne.” The “P” means the chip uses the “large footprint” version with a 22 x 22 mm package size (as opposed to the tiny 13 x 14 mm package footprint for the original version) that can handle industrial temperature ranges. Intel targeted Silverthorne at mobile internet devices (MIDs), but they have also become common in rugged mobile and embedded devices. The Silverthorne chips use the “Poulsen” System Controller Hub that was developed specifically for the Z5xx Series. The chipset—which supports PCI-E, S3IO, DDR2, LVDS, ATA 100, LPC and more—uses only about 2.3 watts, which means the total power consumption of the CPU and chipset combined isn’t even 5 watts! That is only a fraction of what conventional Intel notebook processors and chipsets use. And the Poulsen chipset even has hardware support for IL264 and other HD decoding.

**Power consumption**

A major selling point of the Intel Atom processor architecture is its minuscule power consumption. In the past, however, we’ve come across Atom-powered devices that did not make full use of the Atom’s power savings modes, with the result that power draw was less impressive than it should have been. How well does the SR820 take advantage of Atom? The answer is “extremely well.” We used Passmark Software’s BatteryMon power management benchmark utility to measure the SR820’s power draw. With both WiFi and Bluetooth radios off and the screen brightness set to its lowest level, we found a very modest discharge rate of about 6.5 watts. At this rate, the SR820’s 38 watt-hour battery lasts 5.75 hours. Not bad for a device with a bright 8.9-inch display and a relatively small battery.

In real life you probably want WiFi and Bluetooth turned on. In our tests, this added only about a quarter of a watt of power draw—almost negligible. Turning the display’s LED backlight up to full power has a larger impact and adds about a watt and a half, with the SR820 still only drawing about 8.5 watts.

Samwell did a great job putting the SR820’s Atom processor’s power management and low power consumption to good use. The company’s estimate of up to six hours of battery life seems achievable.

**Performance**

Being such a fuel miser, how fast is the SR820? Based on our benchmark library of Atom Z530 systems, we expected the machine to feel about as fast as a consumer netbook (which are actually based on a different family of Atom processors) and its relative performance compared to most full-size rugged tablets on the market to be at about the 60-65% level.

We used 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 benchmark results for devices with different versions of the Z-Series Atom processor, the Atom N270 used in millions of netbooks, and also the Intel Core Duo

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**Table:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Processor</th>
<th>Thermal Design Power (TDP)</th>
<th>CPU Speed</th>
<th>Memory</th>
<th>Display</th>
<th>Overall PassMark</th>
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</thead>
<tbody>
<tr>
<td>Samwell</td>
<td>Atom Z530</td>
<td>2.2 watts</td>
<td>1.40 GHz</td>
<td>2GB DDR2</td>
<td>1280 x 800</td>
<td>167.4</td>
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<tr>
<td>Handheld</td>
<td>Atom Z510</td>
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<td>1.10 GHz</td>
<td>1GB RAM</td>
<td>800 x 600</td>
<td>116.1</td>
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<tr>
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<td>Atom Z530</td>
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<td>1.60GHz</td>
<td>2GB DDR2</td>
<td>1280 x 800</td>
<td>170.3</td>
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<tr>
<td>FieldBook</td>
<td>Atom Z530</td>
<td>2.4 watts</td>
<td>1.80GHz</td>
<td>4GB RAM</td>
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<td>191.9</td>
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<tr>
<td>Winmate</td>
<td>Atom N270</td>
<td>2.5 watts</td>
<td>1.20GHz</td>
<td>2GB DDR3</td>
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<td>312.6</td>
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</tbody>
</table>

For more detailed results, please visit www.RuggedPCReview.com.
U2500 in used in many standard-size tablet PCs. The benchmark figures show pretty much what we expected. They demonstrate where Atom Z530-based systems fit in general, what the performance difference is between Atom processors with different clock speeds, how Atom "Silverton" devices compare with Atom "Diamondville" systems, and how Atom compares with the Core Duo U2500. In essence, Atom-based systems deliver netbook performance, which makes them quite suitable for a wide variety of tasks, although they cannot meet the performance of Core Duo-based systems such as those with the popular 1.2GHz Core Duo U2500.

Note that benchmarks are only an approximate indicator of performance, and that they can yield misleading results when different processor architectures are being compared. However, after having run hundreds of benchmarks, we found that the bottomline is usually a good indication of a system's overall performance.

In daily usage, the RUGGEDBOOK SR820 feels lively and responsive, and it is definitely up to most jobs. However, Atom processors do have performance limits, so those with high performance requirements must ascertain that an Atom-based system can handle their applications.

Storage

Our SR820 review unit came with a 2.400rpm 120GB Toshiba MKG020G6A hard disk. This is a 1.8-inch design with a Parallel ATA interface and an almost unbelievable 100,000 hours mean time to failure. That’s almost 35 years!

The disk assembly weighs only over three ounces, has an idle power (around one watt) while reading or writing (about 0.6 watt while idle), and operates silently. Its lower operating temperature limits at 41 degrees Fahrenheit, however, limits the SR820 to the same value. The SR820 can also be ordered with a Solid State Disk (SSD) in 6 or 64GB capacities, which also lowers the operating temperature range to 32F.

Wireless communication

As expected in a modern mobile computer, the SR820 includes WiFi and Bluetooth and can also be ordered with additional wireless options.

For WiFi, the tablet comes standard with an AuzeroWave 802.11b/g/n WiFi AW-N766e wireless network card. It is a very compact PCIe mini card that supports both the legacy 802.11b/g protocols as well as the new N standard protocol and its much faster receive data rates of up to 300Mbps (802.11a/n/g is good for up to 54Mbps). In addition to the potential 5GHz bandwidth and up to 33 percent increase in the AuzeroWave module is very power-efficient.

A Broadcom Bluetooth Class II version 2.1 with 3.0 USB Data Rate (HCR) module provides theoretical maximum speed of up to 3 megabits per second. Optionally available is a cellular voice/data radio. Our review unit had a BandXlate HSUPA M250 mini-PCIe card that supports Triband HSDPA/EDGE (850, 900, 1900, 2100 MHz) and Quadband GSM/GPRS/EDGE (850, 900, 1800 and 1900). Maximum HSPA/WCDMA downlink data rate is 7.2 Mbps, uplink 2 Mbps. The BandXlate module comes with an attractive and quite extensive control panel with settings (network and SIM, SMS, SIM, statistics (up and download and connection log), contacts, profiles, an SMS screen (inbox, outbox, compose, drafts) and a cool home screen that shows connection time and data. Optional laser scanning is provided by an integrated 3.3

Volt Symbol SE955 1100R module, a frictionless miniature scan engine designed for superior reliability, enormous ruggedness (shock up to 2000G), and great durability thanks to a Liquid Polymer scan element. It can do up to 100 scans per second, yet accurately captures even damaged and poor quality code. Note, however, that the scanner module takes the place of the RS232 serial port, so it’s either one or the other, but not both. The scanner module is shown to the right.


According to Samwell, a Symbol SE4500/PL4507 1D/2D imager will be optionally available the end of May 2010. It will read all major 1D codes as well as the following 2D symbologies: PDF417, MicroPDF417, Composite, RSS, TLC-39, Datamatrix, QR code, Micro QR code, Aztec, MaxiCode and the US PostNet, USPS Planet, UK Postal, Australian Postal, Dutch Postal, Japan Postal, (KIX) postal codes.

Integrated camera

The SR820 has an integrated 2-megapixel camera mounted in the center top of the backside of the computer. The camera is meant to be used to document conditions or whatever benefits from image documentation. It can be accessed via custom applications, but also from the “Scanners and Cameras” utility that’s part of Windows XP.

Unlike many cameras integrated into handhelds, or the tablets in the SR820 works amazingly well and provides sharp and decent quality pictures. In fact, the 1600 x 1200 pixel images are good enough to do things like taking pictures of labels, documents and other subjects where being able to see and read fine detail is crucial. Note that the Windows utility is very basic and offers no control over exposure settings. For that, you’ll need a dedicated camera utilities or software that supports the camera.

If a basic 2-megapixel camera is not enough, as of May 2010, Samwell will offer an optional integrated 5-megapixel camera with auto-focus for those who heavily rely on image documentation capabilities in their mobile computers.

Competent 8.9-inch display

The SR820 Anti-glare 16.1” WSXGA LCD display comes from Chi Mei, which is the third largest LCD manufacturer in the world. It has LED backlight, vertical striping, 3840x2160 resolution, 40 pin LVDS interface, an operating range of 32-122 degrees Fahrenheit, and can display 256k colors. Lifetime of the LED light bar is 15,000 hours (which means you’ll likely never have to replace it), horizontal viewing angle is 45 degrees in each direction, vertical viewing angle a more modest 20 degree up and 45 degree down.

Like most tablet PCs, the RUGGEDBOOK SR820 will be used outdoors where the display must be viewable under many lighting conditions. Our unit came with the optional sunlight-viewable display. The picture below shows an outdoor comparison between the SR820 and an Acer Aspire One netbook. The SR820’s display is a bit brighter and hugely more readable thanks to very

**SAMWELL RUGGEDBOOK SR820**

**Type:** Rugged Tablet PC (fanless design)

**Chassis/housing:** Magnesium alloy chassis/housing, rubber bumpers

**Processor:** 1.6GHz Intel Atom Z530P with STKB 1.2 cache and 533MHz FSB

**Graphics/chipset:** Intel "Poulsbo" System Controller Hub US15WSP, Intel Graphics Accelerator 500 (Intel GMA 500) with graphics (integrated in US15WSP)

**Thermal Design Power:** 2.3 watts

**OS:** Windows XP Tablet PC Edition

**Memory:** 2GB DDR2 800MHz in one slot

**Display:** 8.9” WSXGA (1024 x 600 pixel) TFT with LED backlighting; optional sunlight readable version

**Digitizer/Pens:** 4-wire resistive touch screen

**Keyboard:** Onscreen keyboard

**Storage:** 60 GB shockmounted 1.8-inch 4200rpm PATA hard disk (Toshiba MK6020GAL), optional 16/32GB solid state disk

**Expansions slots:** 1 SD Card + 1 SIM

**Size:** 10.1” x 6.2” x 1.5” (inc. rubber bumpers)

**Weight:** 2.9 pounds as tested (with battery and bumpers)

**Ruggedness:** Shock (SSD): MIL-STD 810G, 506.6 VI; Foot drop, over concrete, onto each edge, face and corner (26 drops total); Mechanical shock (SSD) MIL-STD 810G, S16.5 Procedure 1; 406 saw-tooth pulse while operating (3 shocks each axis, 18 total); Vibration: random wave forms 1-200 Hz 90 min per axis; Ingress Protection: IP65; Operating Temperature: 32 to 140 degrees Fahrenheit (SSD), 41 to 122 degrees Fahrenheit (HD); Temperature/humidity MIL-STD-8101G, Method 507.5; Altitude 15,000 feet operating per MIL-STD-810G, Method 508.5, Procedure II

**Power:** Dual 7.4 Volts, 5,200mAh 3B watt-hour Li-Ion battery system (“6 hours”

**Communication:** Wireless options 802.11b/g/n WiFi, Bluetooth V2.1 + EDR Class 2; optional integrater 50-channel uhfGPS, 1D or 1D/2D barcode scanner, HSUPA/GPRS 3G mobile broadband (WWAN uses mini-PCIe slot)

**Interface:** 2 USB 2.0, 1 RS232 (or barcode scanner), RJ45, VGA, audio input/output, integrated 2-megapixel camera (optional 5-megapixel camera with autofocus by end of May 2010)

**Price:** depends on configuration

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REVIEW: SAMWELL RUGGEDBOOK SR820

The Samwell RUGGEDBOOK SR820 provides netbook size and convenience in a rugged tablet form factor. Measuring just 10.1 x 6.2 x 1.5 inches and weighing under three pounds, the SR820 is smaller and lighter than full-size rugged tablets without requiring many compromises. Its 8.9-inch touch screen with 1024 x 600 resolution (1024 x 768 interpolated) is large enough to be useful. There is good wired connectivity on board, all the connectors are standard size, and there is a wealth of wireless functionality (including available GPS and 3G radio) and also an 2-megapixel integrated camera and optional laser scanner.

Powered by an 1.6GHz Intel Atom Z530P processor, the SR820 provides a balance between decent performance and long battery life, thanks to the very low heat dissipation of the processor all without the need of a fan. While heavy-duty multimedia is not the SR820’s strong side, it feels quick and responsive in most situations, and the 38 watt-hour battery lasts for up to six hours.

The 8.9-inch display is bright and sharp, and offers good outdoor viewability without any glare. The resistive touch screen works well and is highly configurable, but does not offer the smooth inking of an active digitizer (which we’d like to see as an option).

For a very compact tablet computer, the SR820 has good onboard connectivity with USB, LAN, VGA, audio and either a serial port or a laser scanner, as well as additional connectivity via the optional dock. For on-board storage expansion there is a user-accessible SD slot card slot in the battery compartment. The integrated 2-megapixel camera offers very good image quality for documentation.

The SR820’s nicely designed magnesium alloy chassis, rock-solid construction, and steel-backed rubber bumper protection combine to make a rugged, durable tablet computer able to withstand accidents and exposure to the elements in the field. The device is also well-sealed with individual rubber plugs, which we’d like to see the actual ports sealed as well.

With the RUGGEDBOOK SR820, Samwell introduces a tablet equivalent of a rugged netbook computer. It’s smaller and lighter than standard-size tablets, but has most of the features and performance, but is much more compact and offers better battery life.