June 19, 2019
02:29:51 PM EST

Why the display of a mobile device is so important (Field Technologies Magazine, September 2013)

Every computer a mobile computer (GPS World Magazine, July 2013)

Trimble Nomad 900

Leading edge technology meets ultra ruggedness in waterproof next generation outdoor handheld

(by Conrad H. Blickenstorfer)

Note: *On November 8th, 2010, Trimble announced the Nomad 900, which replaces the Nomad 800. However, the review remains valid as the changes between the Nomad 800 and 900 models are, while important, minor. The Nomad 900 uses Windows Mobile 6.1 instead of 6.0, supports high storage capacity SDHC cards instead of just SD cards (that max out at 2GB), has a higher resolution 5-megapixel camera, offers improved postprocessing GPS accuracy of 1-3 meters as opposed to 2-5 meters, and generally enhanced GPS, and has CISCO-certified WiFi. Some options have changed, but other than that, the Nomad is unchanged.*

The Trimble/TDS Nomad was a device whose arrival here at RuggedPCReview.com we anticipated more than most. That's in part because it is the first rugged handheld computer to use the new 806MHz Marvel PXA320 processor, and in part because we had some special testing planned for this device. In this hands-on review we explain the Nomad, how it feels and works, and what it can do.

Thanks to the much appreciated efforts of Julia Oliver, Amy Urban and others, a new Trimble Nomad arrived early September 2007 here at RuggedPCReview.com. We were excited about and quickly recorded some first impressions:

"The Nomad comes in nice, neat packaging, all in environmentally friendly cardboard. The power supply is shipped with several international inserts so you can charge the computer pretty much everywhere without having to hunt down some foreign power plug adapter. I really like this. It costs Trimble extra, but it also shows they care and want to go the extra mile in every respect.

"The Nomad itself is everything I expected from TDS/Trimble. We've reviewed quite a few TDS products over the years at Pen Computing and RuggedPCReview.com. They almost always combine great industrial design and style with a rugged feel that's uniquely trust-inspiring. When I review a rugged device, I often look at it and mentally determine what it is likely able to survive. And often I wisely decide not

Specifications Trimble Nomad

Added/changed	Added 9/2007; updated 11/2010
Form-factor	Rugged handheld computer
CPU Speed	Marvell XScale PXA320, 806 MHz
OS	Windows Mobile 6.0 (classic edition) Nomad 900: Windows Mobile 6.1
RAM/ROM	128MB/512MB-1GB non-volatile Flash
Card slots	1 SDIO, 1 CF Card Type II (both sealed) Nomad 900: SDHC
Display type	Outdoor-viewable color LCD
Display size/res	3.5-inch/480 x 640 pixels
Digitizer/pens	touch/1
Keyboard/keys	on-screen
Navigation	Backlit PDA or numeric style keypad, stylus, touch
Housing	Plastic
Operating Temp	-22 to 140F
Sealing	IP67 (incl. water immersion to 3.3 feet for 30 minutes)
Shock	26 drops from 4 ft onto plywood over concrete
Size (WxHxD)	3.9 x 6.9 x 1.95
Weight	20.8 ounces (including battery)
Power	3.8V/5,200mAH Li-Ion ("15 hour")
Interface	USB host and client, audio,
GPS	optional: Integrated GPS (SiRFStar III, WAAS Capable) Nomad 900: enhanced GPS postprocessing accuracy and instant fix.
Wireless	Bluetooth 2.0, 802.11b/g (Nomad 900: WiFi Cisco certified)
List price	inquire
Brochure	Nomad 900 product brochure
Web page	Trimble Nomad 900 page

Windows Mobile Info

- **Windows 10 IoT Core**
- **Windows Embedded 8.1 Handheld**
- **Windows Embedded Compact 2013**
- **Windows Embedded 8 Handheld**
- **Windows Embedded Compact 7**
- **Windows Embedded Handheld**
- **Windows Phone 7**
- **Windows Embedded CE 6.0 R3**
- **Windows Mobile 6.5**
- **Windows Mobile 6**

to put certain parts (and claims) to the test. The Nomad, on the other hand, looks and feels invulnerable and is extremely well put together.

What is the Trimble Nomad

The Nomad is a rugged handheld computer designed for people who work outdoors. It is built to take the kind of abuse that can happen in the field: dust, water, drops, vibration and so on. It is also built to run for a long time on a single charge, and to accommodate a variety of connections and peripherals. A computer that can handle all that is not going to be as small and light as a cellphone or a PDA,, and the Nomad isn't. It has a footprint of about 6.9 x 3.9 inches and is just under two inches thick. It's actually a bit less in all dimensions as those measurements apply to the largest dimension in all directions. The Nomad's housing is tapered and curved and feels smaller and handier than those numbers suggest. It does weigh 1.3 pounds, including battery. This is clearly not a Pocket PC in the sense that you can stick it into a pocket. However, it is also not huge. You can easily hold it in one hand.

Like the company's Ranger and Recon products before, the Nomad sports a ruggedly handsome industrial design. The recipe remains unchanged: Use a very tough plastic shell that is essentially invulnerable to protect the electronics inside. Use thick rubber endcaps to protect the unit while sealing it effectively and allowing customization through a variety of such endcaps. And build it such that it can operate in extreme temperatures, survive drops, survive vibration, survive operation in dusty environments, and be able to withstand not only rain, but also actual immersion in water.

That's a tall order, but the Nomad can do it. It's tested to run between -22 and 140 degrees Fahrenheit. It survived 26 drops from four feet onto plywood over concrete. It earned an IP67 ingress protection rating. It is tested to survive humidity, vibration and altitude according to the procedures described in MIL-STD 810F.

Yet, despite all this, the Nomad doesn't look and feel like some sort of forbidding experiment from a secret lab. Instead, it looks and feels like a tough tool for the job, nothing more and nothing less.

Oh, and a word about "flex." In our initial draft we complimented the Nomad as having "zero flex" because that is how it feels. We have little confidence in mobile equipment that twists and creaks. Well, in discussions with TDS we found that the Nomad's designers actually *used* calculated flex to make the unit even stronger. Upon severe impact it gives a little to absorb some of the force -- just enough to afford even better protection.

Advanced technology

Rugged notebooks and handhelds used to be way behind the technology curve. That has changed in recent years as more and more companies, agencies and governmental entities use mobile computers on the job. These computers are part of overall IT strategies where obsolete technology has no place. So things have changed, and TDS has always been at the forefront of adopting new technology. It's no different with the Nomad, but this may be the company's most impressive and aggressive use of leading edge technology yet.

First of all, the Nomad is probably the first rugged handheld to use Marvell's next generation PXA320 processor, a chip that runs at 806MHz. Marvell bought Intel's XScale application processor business in 2006, and so all former Intel PXA chips are now Marvell chips. The new PXA320 that's used in the Nomad is the flagship of the PXA3xx series, codenamed "Monahan." It can scale from 806MHz to 624MHz to conserve power when full performance isn't needed. The processor is more energy-efficient than the predecessor PXA270 "Bulverde" chip, especially under heavy video and audio load. The PXA320 can run VGA resolution video at 30 frames per second, support a 5megapixel digital camera, video telephony, all at lower power consumption than the older XScale chips. So Trimble/TDS chose wisely.

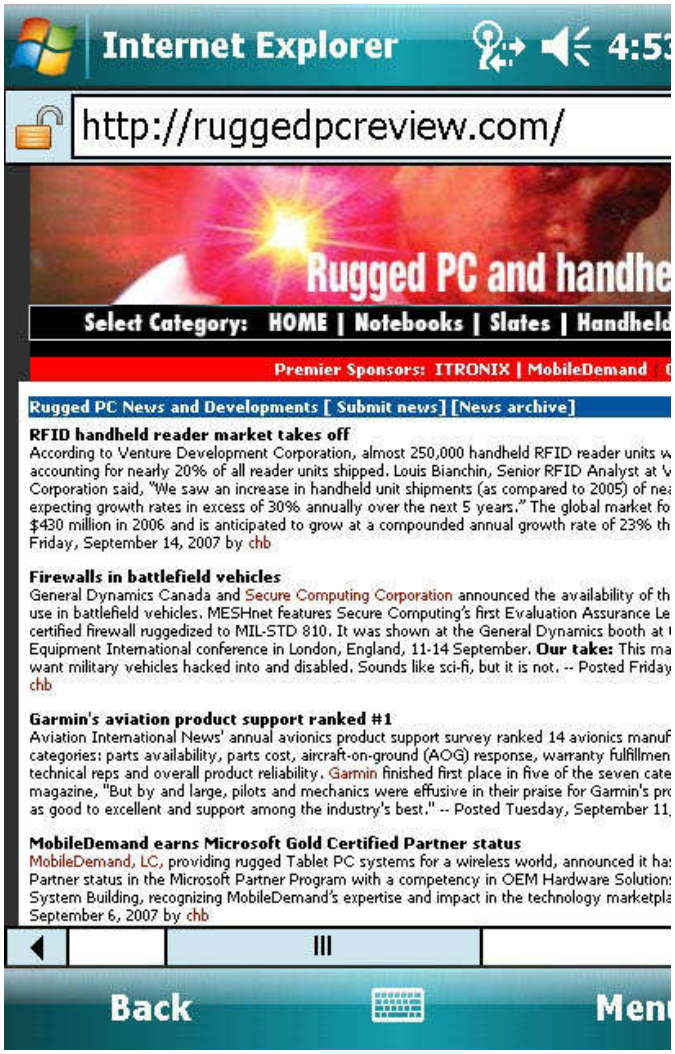
The display

Display technology is important. If you work outdoors you need to be able to see what you're doing even in bright daylight. And if you run sophisticated applications, you want a display that is large and has high resolution. Well, the Nomad has an outdoor-readable display that measures 3.5 inches diagonally and has full 480 x 640 pixel VGA

resolution. To put that in perspective, that is the same resolution as that of the awesome HP iPAQ 4700 Pocket PC (now replaced buy the iPAQ 210 Enterprise Handheld), but the Nomad's display is even sharper because it uses a 3.5-inch display versus the HP's 4-inch screen. If you use Internet Explorer on the Nomad and set the display to high resolution and the text size to smallest, the text is tiny, but razor-sharp. It's stunning.

How does it match up with the highly praised screen of the Apple iPhone? Well, the iPhone has 320 x 480 pixels on its 3.5-inch display. HALF that of the Nomad.

Below is an actual screen capture from the Nomad with the font set to its smallest size. We cropped is so it would fit this column without having to downsize it in Photoshop.



Little things: the stylus

One thing I really like about TDS is that they sweat the little things. We're all used to those plastic styluses or styli or whatever you want to call them. They're in every PDA, and most are exceedingly wimpy. Not the one that comes with the Nomad. It's a slim but hefty black metal stylus with a springloaded plastic tip that can be replaced. The springloaded tip feels terrific -- much better than a fixed tip. On the other side of it is a Philips screwdriver just right to open the battery compartment screws. There's a plastic cap to cover it, and a hole so you can tether the stylus to the Nomad.

Yes, it's a small thing, but it matters. Oh, and one reason the stylus is metallic is because TDS also uses a magnet to hold it in its place. It doesn't have a conventional "garage" where you store the stylus inside the housing. Instead, there is an indent on the back of the unit that holds the stylus with a combination of friction and magnetic force.

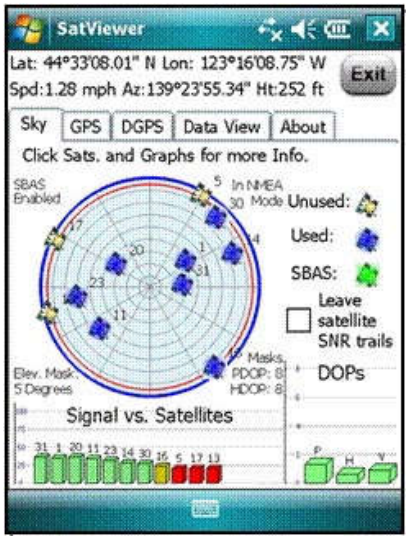
Connectivity

Windows Mobile devices are not like laptops that have whole rows of connectors and jacks. They are too small for that. Connectivity is primarily via a USB connection to a host computer. As far as wired connections go, the Nomad has both a USB host and a USB client plug. There is also an audio jack. All three, plus the power jack, are located at the bottom. They are exposed to the outside. That is because the seal is inside.

Communications

Wireless communications capabilities are often key to productivity, and TDS made sure the Nomad has what it takes to connect. The device comes standard with integrated Bluetooth 2.0 to connect to printers and other Bluetooth devices and peripherals.

Configuration options include 802.11b/g and GPS. Our review unit had both, and browsing the web with the new Marvell chip in the Nomad and its fast wireless "g" connection is sheer joy compared to the barely acceptable experience in older handhelds. Many pages load almost as quickly as on a desktop, something I never thought possible just a couple of years ago.



The optional integrated 20-channel SiRFStar III GPS is WAAS capable. SiRFStar III is a high sensitivity GPS microcontroller that provides very speedy Times to First Fix and offers excellent signal lock. The WAAS acronym refers to Wide Area Augmentation System that uses earth-based stations to improve accuracy via correction signals. Expect accuracy as close as 15 feet and no worse than 50 feet. That's the hardware side. On the software side, the Nomad comes with Tripod Data Systems' SatViewer, a handy GPS utility that lets you check the GPS configuration and settings. The screen to the right shows the SatViewer's Sky Plot, a graphical representation of where available satellites are in the sky, and what their signals strength is. SatViewer is not itself a mapping or GIS application, but it definitely helps to get the best performance out of the GPS receiver.

Expansion

The Nomad can be expanded both via optional internal modules and through its two card slots. The slots are sealed inside the device, but are readily accessible once the top end cap is removed. A CompactFlash Type II slot allows for expansion via numerous peripheral cards that use the CF format. A SDIO slot will typically be used for extra data storage, but can also be used with SD-based peripheral cards.

Power

Back when Palm Pilots ruled the PDA world, their battery power was measured in weeks, not days or hours. Windows CE devices had less battery life, but theirs was still in the 6-10 hour range, much better than what laptops got. But then notebooks got more efficient and Pocket PCs worse. Only occasionally could a handheld actually make it through a whole shift. TDS obviously will have none of that. The Nomad's big 20 watt-hour Li-Ion battery is rated at a full 15 hours of operation with default settings. That's almost two shifts.

The battery is user-replaceable via the back of the device. It sits under a sturdy black ABS plastic cover secured by four screws and sealed with an O-ring.

Configurations options

The Nomad is a highly configurable device due to its internal card slots and its replaceable end cap. Options include the above-mentioned

802.11b/g WiFi and GPS, but also a 9-pin RS232 serial connector for legacy peripherals, an integrated 1D bar code scanner, and an integrated 2-megapixel digital camera. The keyboard also comes in two configurations, one with a numeric and one with a "PDA" keypad. The standard configurations are:

- 800B - 512MB Flash, Bluetooth
- 800L - 1 GB Flash, Bluetooth, GPS, WiFi
- 800LC - 1 GB Flash, Bluetooth, GPS, WiFi, camera
- 800LE - 1 GB Flash, Bluetooth, GPS, WiFi, camera, laser scanner

The top-of-the-line 800LE only comes with the numeric keypad, the others can be had with either keypad.

Custom configuration is made easy with the end cap system. Some are extended end caps that stick out so they can accommodate oversized CF cards. Others, like the Serial Boot add certain options -- such as a full-size legacy serial port -- and replace another that may not be needed, like a USB host port.

Software

The Nomad is based on the "Classic Edition" of Windows Mobile 6. "Classic" means it's what we used to know as the standard Pocket PC version. These days, the standard version of Windows Mobile is the wing-clipped smartphone configuration whereas the much more complete Pocket PC version is now "classic," Go figure, but that is a Microsoft issue.

As is, you get Office Mobile with Word, Excel and PowerPoint; Mobile Internet Explorer, the Windows Media Player, the usual PIM applications, Messaging, Messenger, as well as a slew of system utilities -- almost 30 in Windows Mobile 6. Some are excellent and useful, such as the Wireless Manager that lets you quickly turn WiFi, Bluetooth or GPS on or off. Others are in dire need of a fundamental overhaul, such as the ever-infuriating "Connections" utility that seems hell-bent in befuddling users with virtually nonsensical options and a curious insistence on modem connections when almost no one still uses those. Again, a Microsoft problem.

I simply have to comment a bit more about Windows Mobile. It in no way measures up to the great quality of the hardware it runs on. It is clumsy, kludgy, often incomprehensible, ugly, and light-years behind the effortless elegance you see on, say, the Apple iPhone. I know I mentioned this several times now on what is, after all, a hardware product review. But Windows Mobile gets in the way and lessens the user experience so often that it simply must be said. This even applies to Active Sync, the portion of the Windows Mobile software that runs on the Windows host. We installed the latest version in three different, two laptops and a notebook. Neither managed to find the Nomad and establish a connection with it. Windows simply considered it an "unknown USB device." Good grief, Microsoft!

Most Nomad users will likely use custom or third party software to take advantage of the superior power and flexibility of this device.

Using the Nomad

Using the Nomad is a pleasure for the reason alone that it feels so competent. The device is ergonomically designed so that it perfectly fits into your hand. TDS supplies a snap-on elastic handstrap that makes things even easier.

The Nomad's 22-key keypad comes in handy for rapid data entry. It also has two buttons for phone-style on-screen softkeys. Users can still select from four different entry methods: Block Recognizer, Keyboard, Letter Recognizer, and the Transcriber handwriting recognition system. Given the presence of a full keypad, I'd like to see Tegic T9 offered as well. It is ubiquitous on cellphones, and millions are very adept at it. I wonder how many people still use Transcriber. It's gotten better and better and works very well on the Nomad's high-res screen. I cannot overemphasize the sheer feel of precision every single part of the Nomad invokes. Down to individual keys on the keypad.

The 806MHz Marvell processor really makes a difference. Everything just flies. There is none of the sluggish screen redraws that bedeviled older Windows Mobile devices. Virtually everything happens instantly.

Battery life seems right up there. The battery gauge hardly moves. There is a handy Battery Logger utility that tracks battery %, battery

voltage, backlight % and battery current. Do some logs and study them to get a good idea of how long the battery lasts and how it drains.

If there is one flaw to the terrific LCD display it's that it is fairly deeply recessed and doesn't have a margin around its perimeter. That means you often have to hold the stylus at an uncomfortable angle to get to the scrollbar along the edge of the screen. It also means that there can be large shadows on the screen when you use the Nomad outside. And the screen surface is very highly reflective. At times you have to view at it from several angles to get rid of the reflection. The vertical and horizontal viewing angles are very good, but not perfect. You can still see what is on the screen, but there is considerable color shift.

Is the Nomad really waterproof?

Yes, we decided to put that to the test. We routinely test underwater cameras and take them to and beyond their limits. Olympus now makes a point & shoot digital camera, the Stylus 770 SW, that is crushproof, freezeproof, shockproof and waterproof, down to 33 feet (and we had it to almost 80). It's just a nicely designed consumer camera, but it would earn an impressive IP58 rating even though it has numerous little hardware buttons, a fairly large screen, a microphone and so on. It can be done. So why not computers?

The Nomad is IP67 rated, and its specs say it can survive immersion to 3.3 feet of water for half an hour. So we set up camera gear, both above and underwater, I donned my scuba outfit, and, after putting the Nomad under by a couple of inches to see if there were any tell-tale bubbles escaping from it, declared it fit for an underwater test. I made sure not to exceed the stated depth, but I did dive with it. I even sat down underwater, went through menus and functions, and even used handwriting recognition to see if the touchscreen would be affected by the water pressure. I didn't think it would. Four feet of water is just about 1/8th of an atmosphere, and the touch screen was indeed unaffected. One thing that happened: the headset button turns on the voice recorder, and that happened by itself underwater. So I disabled it, while underwater. The reflectivity of the display was worse underwater. Between that wearing a dive mask, reading the screen was at times difficult. Else, no problems at all. None.

All in all, we had the Nomad under for a good 30 minutes, at depths ranging from two to four feet (and perhaps five or six at times). We do NOT recommend you try that. But we can now state with authority that the TDS Nomad is indeed totally waterproof. Don't believe us? See below:

Bottom Line

The TDS Nomad ranks right up there with the best conceived, designed, and most meticulously executed rugged handhelds we've tested over the past 14 years. Its superb industrial design is ergonomic, attractive and functional. The technology is state-of-the-art, and in some areas beyond. The result is an eminently practical, powerful handheld computer that can tackle whatever task it is assigned to. Its Windows Mobile platform is the usual mixed blessing:

supported by Microsoft and IT and a huge develop base, but balky and recalcitrant. We all have to live with that.

So what you get here is a very powerful, very flexible outdoor computing platform that delivers. Use it for surveying or mapping, scanning, communicating, data capture, number crunching, or even imaging with the optional digital camera. The applications are endless, and no matter where the machine is deployed, it can handle any abuse that comes its way. Easily.

Trimble/TDS Nomad highlights:

- Ultra-rugged handheld computer that can survive almost anything
- Superb industrial design and ergonomics
- State-of-the-art technology, including blazing next-gen Marvell processor
- Superb outdoor-readable display with full 480 x 640 VGA resolution
- Easy to configure and customize via end cap system
- Latest version of Windows Mobile adds security and functionality
- Comprehensive quality and attention to detail
- Completely waterproof (we tested it underwater)

But keep in mind:

- Recessed display can make it difficult to reach all parts of the touchscreen
- Screen glare can be an issue
- Dated Windows Mobile software lags behind state-of-the-art hardware