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HANDHELD **Nautiz** X3

POCKET-SIZED ULTRA-RUGGED MULTI-PURPOSE COMPUTER

by Conrad H. Blickenstorfer, photography by Carol Cotton

The Handheld Group is a worldwide supplier of rugged PDAs and mobile computers. Together with its partners, Handheld delivers complete mobility solutions to businesses in industries such as logistics, forestry, geodesy, construction, public transportation, service and maintenance, and military and security. The Handheld Group has local offices in Sweden, Finland, the Netherlands, Italy, Australia and the USA. When Handheld announced the Nautiz X3 in late 2010, it became the third member of the company's Nautiz line of rugged handheld computers that also includes the Nautiz X5 and X7, as well as the X5-based eTicket and eTicket Pro. The X3 is the smallest and most compact device in the lineup. The stated purpose of the device is to combine strong performance with extreme ruggedness and good value. In a market that has recently seen the introduction of several ruggedized smartphone devices, the Nautiz X3 is on the extreme ruggedness side of things.

All-in-one rugged PDA/scanner/GPS/phone

The picture below shows how the Nautiz X3 compares sizewise to Handheld's Nautiz X5 and X7 models. The handsome multi-purpose device measures 5.9 x 2.6 inches, is an inch thick, and weighs 9.5 ounces as tested. That makes it larger than consumer smartphones, but smaller than the PDAs and Pocket PCs of yesteryear, and it still fits into most pockets. The emphasis here is to offer a device that people can comfortably carry around all day.

As far as technical underpinnings go, the Nautiz X3 is built around the 806MHz version of the Marvell PXA320 application processor. The PXA320 is the latest and most powerful of the mobile processors that started under the Intel XScale label and have powered millions of handhelds over the years. There are 256MB of RAM and 512MB of Flash. A microSD card slot in the battery compartment allows for up to 32GB of additional storage.

The sunlight-readable display measures 2.8 inches diagonally—a bit small perhaps considering that even tiny cameras now have 3-inch displays and larger and the trend in smartphones has been 3.5-inch and larger. It's a conventional resistive touchscreen that can be operated with a finger or the supplied stylus. The backlit 22-key phone-style keypad with smaller alphanumeric lettering includes a navigation diamond as well as ten(!) function keys and a dedicated scan key.

Part of the reason why the Nautiz X3 is thicker than a consumer smartphone is because it has a laser scanner or optional 2D imager. Some smartphones can scan with their integrated cameras, but that's not as quick or accurate as a dedicated scanner. Also, the X3's battery is considerably more powerful than that of a consumer smartphone and can last through a full shift and more.

Like the larger Nautiz X5 and X7, the X3 comes with a built-in 3-megapixel auto-focus camera with a LED illuminator, and you also get the X7's integrated altimeter and E-compass. These state-of-the-art electronic sensing mechanisms—combined with GPS—make interesting new applications possible, such as geotagging and all sorts of GIS and mapping tasks. Advanced location-based functionality is available in conjunction with the unit's mobile

broadband radio that could, for example, be used to connect the X3 to a GIS server for instant database updates from the field. There are many tools built into this unit that, paired with the proper software, open possibilities that used to require multiple devices or weren't available in the field at all.

The Nautiz X3 has a SIM card slot in its battery compartment, which means it can be used as a standard smartphone. Windows Mobile has offered good voice/data integration for years, and that's no different on the X3.

The picture on the next page shows the Nautiz X3 from the front and all four sides. It's an elegant design that also looks and feels rugged and purposeful, like the precision instrument in a field engineer's pocket (or anyone else whose job often includes roughing it on location and on the road) that it is. The term "Nautiz" comes from the ancient Nordic rune alphabet and implies "need" and "necessity," and the X3 answers that in the field.

Going around the Nautiz X3:

■ The top of the unit is protected with tough rubberized bumpers. In the center is the window for either the standard laser scanner or the optional 1D/2D imager. On the left is the garage for the small telescopic stylus, and next to it is a loop to tether the stylus.

- The left side has a scanner button.
- The right side has the audio volume rocker and the protective cover of the unit's 20-pin universal connector that connects to the power supply, the USB cable, and the also supplied ear bud/microphone cable.
- On the bottom is the 8-prong surface-mount docking connector for the optional desktop cradle, vehicle cradle or quad dock.
- The front side has, in addition to the screen and keypad, the microphone, speaker, and two indicator LED lights for phone, charge status and wireless radio status.

The design of the housing is elegant, clean and functional. There are hardly any visible screws and no small parts or details that look like they could break off. The entire device feels solid and capable of standing up to hard use. Note that the black bumpers serve as design elements as well as for protection. They seem glued on and it's not clear if they are meant to be replaceable should they get damaged.

A peek inside

The interior layout and fit and finish of a device tell a lot about the thought that went into the design of a product, and how well it is made. In addition, system integrators and distributors tell us it gives them valuable insight into how easy it will be to service a product.

In terms of construction, the Nautiz X3 consists of a sturdy magnesium chassis encased in plastic upper and lower halves. The two halves form a sealed whole via an intricate replaceable black rubber O-ring style seal around the entire perimeter. Care must be taken to make certain the seal is clean and undamaged whenever the unit is taken apart and reassembled during service. The halves are secured together with eight small Philipps head

screws. Each screw hole has its own little plug so that you don't even see them, making for an elegant look, and perhaps also for easier cleaning and less places for germs to hide and accumulate should a X3 be used in a healthcare setting. On the other hand, the little rubber plugs can get lost.

In the picture above, in the center left you can see Honeywell Adaptus 5100SR (Standard Range) 2D imager with its associated circuit board. The imager has an LED aimer and is designed to scan from about two inches to about a foot for a standard 30 mil bar code (i.e. a code where the narrowest bar is 30/1000th of an inch. Below the scanner is the tiny 3-megapixel camera assembly. To the left of the camera is the white LED used for illumination.

For WWAN, the Nautiz X3 has a Telit UC864-G 3.5G wireless data module that was designed for applications requiring global portability via quad-band GSM/GPRS/EDGE support and tri-band UMTS/HSDPA. On the right side of the unit you can see the X3's microSDHC slot as well as the SIM card slot.

The rechargeable Li-Ion battery pack snaps into the backside of the X3. A locking lever secures it in place, pressing the battery assembly against a rubber gasket to form a seal. The integrity of this seal is important as the battery compartment itself is not sealed to the inside of

the device. There is no bridge battery, so if you need to replace the battery in the field and away from external power, the device will reboot.

The universal port used for USB, audio, power, etc., is not sealed against the housing and thus depends on its protective plug for sealing. That plug has its own red o-ring, so keep an eye on that for potential damage.

Combining USB, power and audio all into one non-standard universal port has advantages and disadvantages. It's easier to seal one plug than three, but users rely on three separate special adapter cables, and the connector wasn't quite as sturdy as we'd have liked.

Overall impression is that the interior of the unit is exceptionally neat and clean, without any fixes or unfinished looking areas. Everything is also tightly secured, nothing rattles or seems in danger of coming loose.

Windows Mobile 6.5

The Nautiz X3 comes with Windows Mobile 6.5. For those used to earlier versions of Win-

dows Mobile, things look different from what they are familiar with. There is a lefthand-adjusted list of the major device functions (such as phone, email, calendar, favorites, Windows live, etc.) Then there is a horizontal bar in the middle of the screen that provides current information. Under Pictures it'd show the last one viewed, under Phone the missed calls, under Emails how many new ones are waiting to be read, under Calendar your current appointments, and so on. You can drag the list of topics up and down, and you can also drag the detail viewer bar up and down. It's an approach that's unusual at first, and it's quite easy to drag the wrong element, but you get used to it and it is a good way to know what's going without lots of tiny print on the screen as was the case in earlier Windows Mobile home screens.

The pictures below show the Windows 6.5 Home and Start screens (left) compared to the older Start/Home screen of Windows Mobile 6.1 (from a Nautiz X7 we had in our lab).

Under Windows Mobile 6.5, apps still show as icons on one single screen that scrolls down, with new apps added at the bottom. The Settings screen is still there, and in it, too, you can see icons for all the various control panels. The old tabs for Personal, Systems, and Connections have been replaced with folders, and all icons, everywhere, are now positioned in a staggered butterfly arrangement rather than in rows and columns. Despite the new Home screen and the other changes, anyone familiar with prior versions of Windows Mobile will have no problem with the latest rev.

While it's not much fun to use a spreadsheet on a small QVGA display, Word and Powerpoint can come in handy, and the Handheld Group confirmed that Windows Mobile Office (Word, Excel, Powerpoint) will be pre-installed in shipping versions of the Nautiz X3.

While web browsing on a 2.8-inch QVGA display with a resistive touch screen is not a great pleasure, it does work (a lot of X3 users will probably have custom web apps designed for the small screen). WinMo 6.5 has a large zoom slider that makes it a lot easier to zoom in and out than it used to be via menus. All fonts remain sharp when zoomed.

Downloading and installing applications on the X3 is easy. If you have internet access, all you need to do is load the Microsoft Marketplace app, then sign in with your Windows Live or Hotmail ID. I downloaded some of the essential apps I can't do without (like Google Maps, Facebook, Handmark's ExpressNews, a few utilities and converters, etc.). Windows Marketplace may not have the number of apps as the Apple AppStore, but there are plenty to choose from, and many good ones are free.

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Controls and data input methods

The ability to quickly, accurately and flexibly enter data into a handheld device is tantamount to its success. Many data entry methods have been tried over the years but there is no clear consensus whether a handheld should have a keyboard/keypad or if a touch screen alone is enough. For professional applications, many favor physical keypads for rapid data entry, but that still leaves the question whether numeric keypads should also be used for text entry, or whether even small handhelds should have mini QWERTY key layouts such as RIM pioneered many years ago. With the Nautiz 3, Handheld opted for a compromise. There is a physical keypad, and it can be used for entering text as well. It's an expanded cellphone layout with some additional keys. The numeric keys that also access numbers, letters and symbols can also be used as function keys, all the way from F1 to F10. No consumer phone can do that.

Getting used to a keypad takes a bit of time, and getting used to a particular way of entering text on a numeric keypad even more. On the X3 there's a key that toggles through upper case, lower case and numbers, and then you select the appropriate one on each key. One problem here is that there's no clue anywhere as to what mode you're currently in. I wonder why Handheld did not include the Tegic (now Nuance) T9 predictive text entry that millions of texting addicts use and love, and they are far more adept at T9 than any other text entry method.

The Nautiz X3 comes with a small metal stylus with black plastic tip that telescopes out. When not in use, it fits into a slot on the right side of the device, from which it is a bit too difficult to extract. You can also use touch to operate the Nautiz X3, and WinMo 6.5s Start page and all the larger icons and touch buttons make it easier to use touch than earlier versions. Overall Windows Mobile remains an interface best used with a stylus.

For data entry, Windows Mobile offers a wealth of options, but the X3 only uses a few of them. There is the integrated keypad, of course, and there is a nice (albeit tiny) pop-up keyboard, but the three text recognition methods (block and letter recognizer, Transcriber) that are usually part of every Windows Mobile installation are missing.

Phone functionality

While Handheld doesn't push it, the X3 can be used as a phone. Simply insert a SIM card and as long as you have an activated account for it, the X3 becomes a powerful smartphone. Here you can tell that Microsoft has many years' worth of Pocket PC phone experience. Everything is logical and nicely integrated. For testing I used the SIM card from my iPhone and it worked without any additional configuration. The X3's voice quality is better than that of most of today's disappointingly tinny dedicated phones. To use the X3 as a phone, you either push the "S" button, drag the indicator bar on the Home Screen to phone, or select the Phone icon on the Windows Start screen where all of the app icons are. The phone application shows the last calls, an onscreen keypad, and access to call logs and speed dial. The call log provides summary information about the number of calls and call time. Individual call log entries provide one-button call-back or SMS messaging as well as access to any notes that may be attached to a call. Or you can create a new Contacts entry automatically. You can also take notes during a call. The note will have the caller's name, the phone number, and the time of the call already on it. Volume for the phone can be set separately from the system itself via a balloon slider box that is always accessible via the menu bar on top of the display.

What this means is that the Nautiz X3 can be used as a full-function phone in addition to everything else it does. The S(end) and E(nd) buttons are nicely sized but they are white on black as opposed to the usual green for answer and red for hangup, and the phone app doesn't make use of the softkeys. The screens below show some of the X3's phone functionality.

Communication and connectivity

The Nautiz X3 was designed to connect in many ways. Wired connectivity is both onboard via the sole universal connector to provide USB services, or via optional docks. The Nautiz X3 comes standard with integrated 802.11b/g WiFi and there is also Bluetooth V2.0 + EDR. The SIM slot that enables the unit to function as a phone also provides access to the integrated UMTS and HSDPA (High-Speed Downlink Packet Access) services on the 850/900/1800/1900/2100MHz bands.

802.11b/g wireless can be used for web browsing, email, terminal emulation sessions, synchronization or, thanks to the unit's microphone and speaker and assuming the necessary software is installed, for VoIP (Voice over IP) voice communication.

Connection to a PC for synchronizing or communication with a backend server or peripheral can be via USB, WiFi, WWAN, or Bluetooth. Relationships can be established via standard Microsoft ActiveSync.

The Nautiz X3 also includes integrated full 12-channel high sensitivity GPS functionality for indoor fixes and simultaneous GPS with voice and data. We'd have liked to see the handy TacLink GPS utility that came with the Nautiz X7 we had in our lab some time ago, but it wasn't installed on the X3. Below are some screen shots from the free Google Maps, which we downloaded from Windows Marketplace:

One feature that sets the X3 apart from any current consumer smartphone is its industrial-strength barcode reading capability. Our X3 came with the optional imager that can handle both 1D and 2D codes. Depending on the type of code, working range is between two inches and a foot (5-30 centimeters), and the scanner works in complete darkness (we tested it) all the way to bright sunshine. When using the 1D/2D imager, there is a pulsing red illuminator light and a green bar that shows the actual reading area. Codes can be read into special scanner apps, and also into the supplied Notes application or any other app that accepts text.

3-megapixel camera

The Nautiz X3 has an integrated camera that can snap images with resolutions of up to three megapixel. It also has an LED illuminator that you can turn on and off via software to add extra light. It's not a flash, but can help generate better close-up pictures. The camera allows users to document field conditions, findings, reports, etc., in resolutions from 640 x 480 pixels up to 2048 x 1536 pixels. Default operation is via the Pictures & Videos application that offers a variety of image capture and

Handheld Nautiz X3 Specs

Type: Pocket-sized ultra-rugged multi-purpose computer

Housing: ABS plastic with rubberized bumper areas

Processor: 806 MHz Marvell XScale PXA320

OS: Microsoft Windows Mobile 6.5 Classic or Professional

Memory: 256MB/512MB Flash

Expansion slots: 1 microSDHC Card slot (up to 32GB), 1 SIM (both in battery compartment)

Display: 2.8" sunlight-readable TFT with QVGA (240 x 320 pixel) resolution

Digitizer: resistive touchscreen

Keyboard: 20-key numeric backlit keypad

Size and weight: 2.6 x 5.9 x 1.0 inches, 9.5 oz. as tested with battery, stylus, camera and 2D imager

Ingress protection: IP65

Operating temperature: -4° to 140° Fahrenheit (-20° to +60°C) per MIL-STD-810G, Method 501.4 Procedure II, MIL-STD 810G, Method 502.4, Procedure I, II, III

Humidity: MIL-STD-810G, Method 507.4, 90% RH temp cycle 0°C/70°C

Drop: 26 drops from 5.9 ft (1.8 m) MIL-STD-810G, Method 516.5, Procedure IV (60°C)

Vibration: MIL-STD 810G, Method 514.5 Procedure I & II

Altitude: 15.000 ft (4572 m) at 73°F (22°C)

Regulatory: FCC, CE and A/C-Tick

Power: Li-Ion 3.7 Volt, 3,300mAh, 12.2 watt-hours

Camera: 3 megapixel camera with autofocus and LED flash; stills up to 1536 x 2048 pixel; video 352 x 288

Communication: 802.11b/g WiFi, Bluetooth Class 2 V2.0 + EDR, 3.0-megapixel AF camera with LED flash, altimeter, e-compass; integrated 3.5G HSDPA/WCDMA/EDGE/GPRS/GSM WWAN, integrated 1D laser scanner, optional 2D Imager

GPS: Embedded GPS (via u-blox chipset and/or Telit UC864-G 3.5G WWAN module)

Interface: USB host and USB client via universal port, docking connector

Price: Starting at US$999

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playback options. You can play slide shows, designate a picture as the Today wallpaper, beam a shot via Bluetooth, email in various sizes, and so on. In capture mode you can set a self-timer or do 5-picture burst mode and you can also set brightness. In video mode you record at 352 x 288 pixels and set time limits (15 seconds, 30 seconds or unlimited).

The camera function of the Nautiz X3 increases the unit's usefulness in documenting things, but it does not replace a dedicated camera. Note that developers and systems integrators often replace Microsoft's basic Camera application or include imagine functionality directly into custom applications.

Power

The Nautiz X3 is powered by a rechargeable 3.300mAh 3,7 Volt Lithium-Ion battery. This amounts to 12.2 watt-hours—less than the X5 and X7 have. Handheld claims the battery is good enough to make it through "even the longest workday" on a single charge.

The battery is part of the backside of the unit but adds a bit of thickness to the device. A friction lever secures the battery and makes for a tight fit. It is unlikely that it will accidentally open. Since the battery snaps onto the housing rather than fitting into it, it would be nice to have an optional larger capacity battery.

Ruggedness

Ruggedness is a big part of the X3's appeal, but how far did the Handheld Group go with it while fending off the extra bulk that always comes with enhanced ruggedness?

In terms of sealing from the elements, one would expect to be able to use a device like the Nautiz X3 in driving rain without babying it, and that's possible due to its IP65 rating. The "6" in the rating means it's dustproof, and the "5" that it can handle water jets from all directions. So short of dropping the X3 into water, everything goes. Anything used as a handheld computer or a phone can and will eventually be dropped. The US MIL-STD-810G military standard suggests a drop height from four feet, because that's as far as something carried will usually fall. Well, Handheld tested and certified the Nautiz X3 for six feet.

Vibration can be an issue if a device rattles around in a vehicle or if it's mounted on something that vibrates. Here, Handheld tested according to MIL-STD-810G for general vibration loose cargo. A rugged device also must be able to function properly in a wide range of temperatures. The Nautiz X3 can handle a very wide range from -4 to 140 degrees Fahrenheit (-20 °C to 60 °C). This means it can be used in freezers as well as desert-like conditions.

Commercial aircraft cabins are generally pressurized to the equivalent of about 7,000 feet altitude, but industrial and military craft are a different story, or there may be a mountain expedition. Handheld claims a 15,000 feet (about 4600 meters) altitude limit.

Overall, the Nautiz X3 covers all the ruggedness basics. You can take it virtually anywhere.

Summary

What the Handheld Group offers with the Nautiz X3 is a very rugged handheld computer that packs a punch, but is smaller and handier than most. It also offers phone functionality, but we'd see that as an additional feature rather than the device's main purpose.

Built around Microsoft Windows Mobile 6.5 and the fastest currently available XScale processor for mobile devices, the Nautiz X3 provides mature and very widely supported hardware and software technology that fits into almost all existing IT infrastructures.

Equipped with a QVGA 2.8-inch touch display, the Nautiz X3 can function both as a PDA as well as a full-function quad-band GSM/GPRS/EDGE smartphone and a tri-band UMTS/HSDPA data communicator. Despite its impressive ruggedness, the X3 weighs less than ten ounces. It's an elegant, well-made and trust-inspiring tool for the job that combines a lot of functionality into one small package. A large number of readily downloadable apps are available from the Windows Marketplace. There's integrated GPS for mapping and GIS applications. For data capture there is a laser or 2D barcode scanner. An internal 3-megapixel camera with LED illuminator light can be used to document data and shoot video (though it does not replace a dedicated camera). The numeric keypad allows for very rapid data entry. The unit's replaceable battery provides full-day operation.

Overall, with the Nautiz X3 Handheld offers an elegant and very compact mobile computer that integrates a highly useful combination of computing, GPS, communications and data capture technologies into one single rugged device that's still small and light enough to fit into most pockets.

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