JUNIPER **ALLEGRO** MX

## A VERSATILE, ULTRA–RUGGED HANDHELD COMPUTER WITH A FULL–FUNCTION KEYPAD

The Allegro MX from Juniper Systems, officially introduced in January of 2009, is an ultra-rugged, no-nonsense Windows Mobile-based handheld comput-er for use in a variety of demanding field applications where reliability and functionality matter above all else. It is a tough, flexible tool for outdoor data collection jobs, and Juniper Systems and their part-ners offer a broad lineup of dedicated software for it.

Overall design

The Allegro MX was designed to be a reliable tool for work in the most demanding outdoors and industrial environments. This is not a small, slender handheld you stick into your pocket. Instead, it's a machine that was engineered with just a couple of simple but important goals in mind: It must let you do your work in the field, and it must never let you down.

The Allegro can either be used via touch or stylus, or via its extensive 62-key keypad that offers all the familiar functionality of a standard keyboard. A total of no fewer than 12 function keys can be hard-coded or programmed as softkeys. The keys provide tactile feedback and the keyboard bezel is remov-able for cleaning without affecting the seal.

As a result, the Allegro is as large and heavy as it needs to be. There is a large data entry and keyboard area in the handle. There are function keys, there is an alpha keyboard, there is a full-size numerical keypad, and there is a large four-way control disc. Everything is designed and configured so that it can actually be used in the field, even with gloves on, and a lot of Allegro MX users wear gloves.
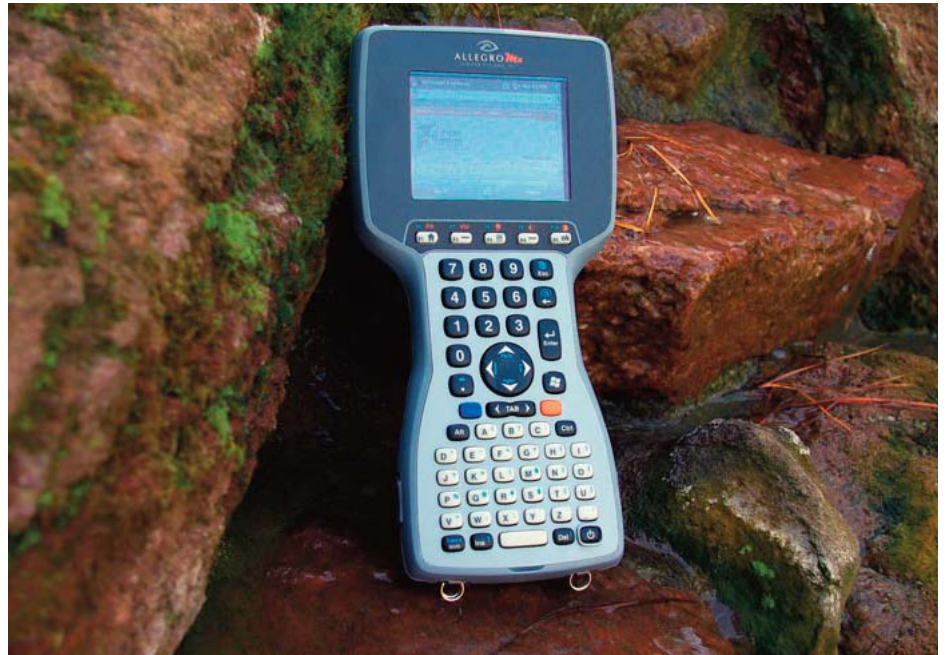
The handle is also large because it accommo-dates a large battery. In the field, you can't afford to run out of battery power in the middle of a job, and carrying and replacing batteries is not what you need in what might be critical conditions. So the Allegro's powerful battery pack lasts not just through a full shift, but through several if need be. It also won't conk out if it gets really cold, as some battery technologies do.

Listening to its customers, Juniper Systems configured the display of the original Allegro com-puter in landscape format. Most PDAs and hand-helds use portrait, but the special software and applications used by Juniper customers works better landscape, and so that's what the Allegro has (and given that virtually all desktop and notebook com-puter displays are landscape indicates that this is what we like best anyway).

Juniper also found that many customers like internal expansion better than external modules that snap onto a device. They accommodated that by offering space for a full PC Card. PC Cards are large, but many important peripherals come in that format, and a PC Card slot can also easily accommo-date the smaller CF Cards via adapters.

Finally, in the field you often need full-size, standard ports, and not tiny little multi-function connectors that require special cables. So the Alle-gro has a full-size standard RS-232 serial port and a full-size standard USB port. They take a bit more room, but when you need them you need them. And

the Allegro's USB port can actually be used with standard USB flash drives—a HUGE plus in the field.

Then there is ruggedness. A lot of engineering goes into making a device rugged, but often simplic-ity is best. Combine a thick, heavy, sturdy protective shell with advanced engineering and you have an unbeatable combination.

The result of all the above is the Allegro MX, a big handheld computer that's ten inches long, five inches wide in the display part, and maybe an inch and a half thick. The whole thing weighs just about two pounds. That's very little in notebook computer terms, but it makes for a very substantial handheld.

Above you can see the Allegro from all sides. It's an ergonomic design. The Coke bottle "waist" makes it easy to hold the device and get a firm grip. The display part is at a slight angle towards the user, so that it is easier to view and operate. And the housing is nicely curved and angled so that it's easy to hold and nothing cuts into your hands or fingers.

Display

The Allegro MX has a landscape-oriented transflec-tive 240 x 320 pixel LCD that measures 3.8 inches diagonally. It has an adjustable LED backlight and works even in ultra-low temperatures without a heater. For applications where display size and contrast matter most, Juniper offers a version with a slightly larger 4.1-inch monochrome display with a paper-like white background. The monochrome

version includes a display heater.

To be honest, we would have liked to see a full VGA 640 x 480 display, or perhaps something even beyond that, like a wide-format WSVGA with 800 x 480 pixels. Such a large and high-resolution display would certainly come in handy for GIS and other common mapping and surveying applications, but the issue, again, is compatibility and how things work in the real world.

We discussed this with Juniper and they found that "*in real world outdoor use, eye fatigue can become an issue and that in many cases it can be more important to be able to easily and quickly see critical data on screen, as opposed to higher resolution that may show more detail indoors, but could be hard to distinguish in harsh lighting conditions*." They also mentioned the inevitable tradeoffs of screen and processor performance, power consumption, and visibility properties in an outdoor environment. Given all the facts and considerations involved, Juniper felt that "*from our research with our customer base, the current high visibility screens were acceptable*." Fair enough.

The image below shows a 320 x 240 pixel screen capture from Juniper System's LandMark Mobile GPS utility program, and it's certainly possible to easily and quickly see critical data, as Juniper felt was important.
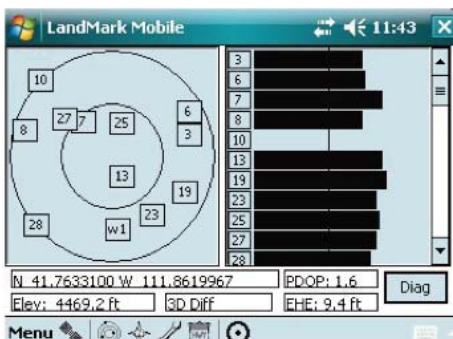
Processor and other technology

On the technology front, the Allegro MX has received several upgrades compared to the still available Allegro CX. Instead of using the older 400MHz version of Marvell's PXA255 application processor to run Windows CE.Net 4.2, the new MX is powered by the 624MHz version of the Marvell PXA270 chip and it runs Windows Mobile 6.1 Classic. which is the latest version available as of this writing. The device still comes with 128MB of RAM, but the amount of non-volatile storage has been increased. It's now up to a full gigabyte in the monochrome version and up to two GB in the color version. This means your data is always safe, even if you run out of battery power.

We asked Juniper Systems why, when designing the Allegro MX, they didn't take the opportunity to switch to the powerful Marvell PXA320 processor family. We should have known the answer. It is continuity and compatibility. By staying with the same processor architecture but offering more speed, Juniper answered the requests of their customer base while maintaining full compatibility with existing systems and software, both from Juniper and from third party developers.

Graphical user interface

As stated above, the Allegro MX uses the Windows Mobile 6.1 Classic platform, a user-friendly operating environment familiar to millions of Pocket PC and Windows CE device users. While Pocket PCs generally have a portrait-oriented display, the Allegro's uses a landscape 320 x 240 pixel format, and so things look a bit different. Below are some of the major screens you see when using the Allegro MX.

When you turn on the device, you get the Today screen, which presents an overview of the current status and provides one-click access to major functions such as email, wireless, calendar, tasks, contacts, and so on. The Allegro MX also comes with a handy "Getting Started" utility that guides new users through common tasks such as setting up email, setting passwords, setting up a Bluetooth headset, and so on.

Windows Mobile has a Programs folder where most of the application icons are. Some applications, such as the Mobile versions of the Microsoft Office applications, have their own separate folder (see screenshots "2" to the right).

Advanced Windows Mobile devices such as the Juniper Allegro MX have a large number of settings and utilities that add to the device's functionality. They are all in the Settings folder that is further subdivided into three sections—Personal, System, and Connections. Some of the utilities have multiple screens that can be accessed by clicking on tabs. Screenshots "3" to the right show the System and Connections sub-folders.

While there isn't much screen real estate for browsing, the Windows Mobile version of Internet Explorer is a

fully functional browser. The Pictures & Videos application lets you view images and video, and there is even one-click access to emailing pictures. You can also zoom in and out, and automatically resize pictures. (See screenshots "4" below)

The Allegro MX has a variety of text entry options. You can use the physical keyboard, an on-screen keyboard, two types of character recognizers (block and letter), and Transcriber, which is a traditional handwriting recognition engine. The recognizers are actually very powerful and there is much history to each one of them. (see screenshots "5")

Expansion cards

The Allegro MX has a standard user-accessible PC Card slot that can be used to add storage or a variety of wireless or other functions. Compared to older versions of the Allegro, a micro-SD/SDHC slot has been added as a much welcome update. Sealing externally accessible expansion card slots is always a challenge. Juniper placed them beneath the large cover in the back of the unit. The micro-SD slot works a bit like some SIM card slots where the cover rotates up so you can insert the card, then folds back down and slides into place.

There is no separate CF Card slot, but CF Cards
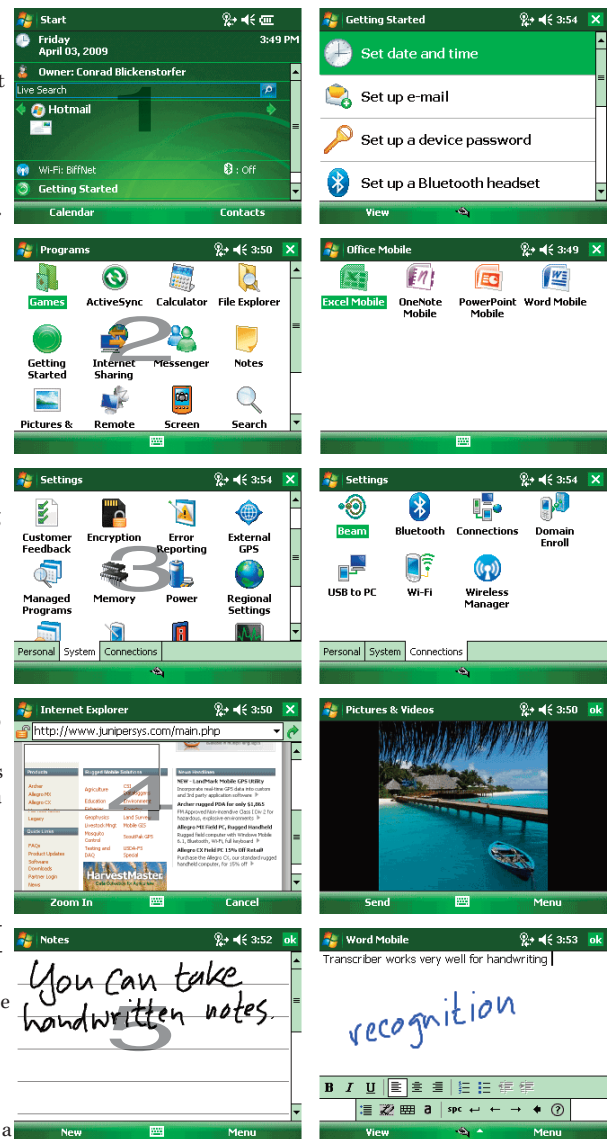
can, of course, be accommodated by using a PC Card adapter. The image above shows the PC Card slot with a CF Card adaptor (left), and the micro-SD card mount (right). We used an 8GB Kingston Technology card during our testing of the Allegro. It is amazing that a card that's smaller than a finger-nail can add so much storage to a handheld device.

For sealing of the card expansion compartment, the Allegro relies on a thick, soft silicon seal that goes around the perimeter of the opening and is glued down so it can't pop out and get lost. Make absolutely certain that the seal is clean and un-harmed, and the part of the cover that makes con-tact with the seal as well.

Expansion pods

The Allegro MX has very good expansion possibili-ties thanks to its internal PC Card slot, but Juniper Systems also offers expansion "pods" for specific purposes. Available are:

- A Bar Code Scanner expansion pod that can scan from up to three feet away and is operational through the entire tem-perature range.
- A GPS expansion pod with a Trimble Lassen LP GPS, which is a high performance, low-power, micro GPS receiver that supports both the TSIP or NMEA protocols and is compatible with Trimble TerraSync software.
- A Data Acquisition expansion pod with up to 16 analog inputs, 2 analog outputs, 8 digital I/O, and two counter/timers. The pod can be used with the 16-bit 6036E, 12-bit 6062D, and 12-bit 6024E Nation-al Instrument DAQCards.
- A DMM expansion pod can be used with the National Instrument PCMCIA-4050 portable 5-1/2 digit multimeter card.

The expansion pods are actually fully integrated into the design of the Allegro. They replace the standard PC card door and are fully sealed. Note the extra "bulge" in the PC Card cover as shown in the small picture above.

Wireless connectivity

There are a number of possible configurations for the Juniper Allegro MX. All color versions include Bluetooth, and Juniper chose a powerful Class 1 implementation with a range of approximately 33 feet and the Version 2.0 + EDR data rate of about 3 Mbit/second.

Compared to the older Allegro CX, the port configuration has changed a bit. Instead of two serial ports you now get one standard 9-pin RS-232 serial port and full-size USB host connector, and that's in addition to the USB client port that was already available before. Infrared is gone in the MX; Bluetooth has pretty much replaced it as a short distance means of wireless communication.

A handy Wireless Manager screen provides one-touch activation or deactivation of wireless services, either one-by-one, or all at once.

Ruggedness

Since it will primarily be used outdoors, the Allegro is extremely durable. It is sealed to IP67 specifica-tions, which means it is dust-proof and won't get damaged even in driving rain or if it falls into a puddle of water. An extremely wide operating range from -22 to 130 degrees Fahrenheit means it can be used practically anywhere. There are some qualifica-tions, such as a minimum temperature of -4 degrees Fahrenheit in order for Bluetooth wireless to func-tion, or that waterproofing means immersion into up to one meter of water (3.3 feet) for no more than 30 minutes.

Juniper Systems' approach to ruggedness and waterproofing is based on simplicity and common sense. Instead of intricate mechanisms that can and will fail, Juniper's engineers relied on straightfor-ward solutions. The hinged cover in the back of the machine presses against a simple gasket seal. Get-ting those seals just right with the proper materials and proper manufacturing techniques took some time, but the design has long since been perfected, and it works. The cover itself is secured by two locking screws that even can be operated with a small coin.

Since it is quite difficult to reliably seal ports and connectors with protective plugs, Juniper used a dual barrier approach. The ports are all fully sealed behind the contacts based on a unique design developed by Juniper to keep dust and water out. A connector protector, attached to the unit so it won't get lost, keeps out dirt and foreign objects, and functions as a bump cap to protect the contacts.

Juniper Systems has the Allegro MX tested according to MIL-STD-810F procedures for resist-ance to water, humidity, sand and dust, vibration, altitude, shock, and temperature. Every single unit is pressure and temperature tested before shipping to a customer.

But is it really waterproof?

Juniper System's Allegro MX promo materials include a cool underwater shot showing the com-puter dropping beneath the surface. And the IP67 rating means it should be able to handle total immersion to a depth of 3.3 feet for up to 30 min-utes. But is it really, really waterproof? It is. We even did an underwater movie of it.

Economic, reliable power

The Allegro MX uses a powerful 14.4 watt-hour NiMH battery that lasts 10 to 20 hours depending on what application is run. That is almost as much as the older and less powerful CX version. We did, however, wonder why Juniper Systems stayed with NiMH technology as opposed to the higher power density Li-Ion technology commonly used today.

We asked Juniper why they chose to stay with a NiMH battery and the company cited a number of reasons. There is the much lower price of the NiMH battery, and the fact that NiMH technology has a history of reliable performance in real-world use

cases. They also pointed out that NiMH generally has better cold weather performance generally than Lithium Ion—a concern for a good number of Juniper Systems customers. Finally, they wanted to maintain consistency between the new Allegro MX and previous Allegro models. A change in battery technology would have meant a change in charging circuitry and maybe also a different case design, and that could have affected legacy peripherals and accessories.

Bottom line is that keeping the power source unchanged and thus usable for both product gener-ations reduces cost, inventory overhead, and even potential customer support issues. And while some batteries cost a fortune to replace, this one is a standard ViewCam BT-H11 used in many cam-corders. It can be found for as little as US$20. An optional alkaline battery holder is available. It holds three AA batteries and the pack is inserted into the

device instead of the NiMH pack. The pack uses alkalines or lithiums, but not rechargeables.

Note that battery life can be optimized via settings. The "Power" control panel/utility not only shows the charge level, but also lets you set automatic turn-off and set CPU speed to five levels ranging from 208MHz all the way to 624MHz, greatly affecting battery life. The "Back-light" panel sets brightness and how long the backlight will stay on if the device is not used. This, too, can be used to fine-tune battery life.

The Allegro offers another interesting feature. Since knowing remaining battery capacity can be essential in the field, the Power panel can be configured for different capacity batteries. You can also enter percentage full for the most accurate readout in the field.

Yet another feature is the in-vehicle charge. If this is clicked on in the Power panel, the battery will stop charging once it reaches 90% capacity. This prevents overcharging and potential damage.

The Juniper Allegro MX: Bottom line

In an industry increasingly dominated by giant conglomerates that often do little more than put their logo on products made half a world away, Logan, Utah, based Juniper Systems brings a human quality to handheld computers. They seem as straight-forward as their products, which are made for people who survey land, check up on natural resources, work in agriculture and other outdoors jobs where it rains, things may fall or get dirty, and where all that really matters is that the gear won't let you down. Their Allegro field computer isn't particularly pretty or slender or lightweight, and it doesn't have chrome or carbon fiber on it. But everything about it makes sense and works as it should. Whether it's GIS software, running custom applications, or fending off a bear, the Allegro can do it, and you can even use it to check email, work on Office documents, or browse the web. *—Conrad H. Blickenstorfer*

Juniper Allegro MX Specs

Type: Ultra-rugged flashlight-style handheld

Housing: Magnesium case with elastomer overmold

Processor: Marvell PXA270/624 MHz application processor

OS: Windows Mobile 6.1 Classic

Memory: Color version: 128MB/2GB; mono version: 128MB/1MB

Slots: 1 PC Card, 1 MicroSD/SDHC

Display: 3.8" 320 x 240 pixel LED-backlit daylight-readable transflective color TFT (also available: Mono 4.1"/320 x 240 with display heater)

Digitizer/Pens: Passive touch screen

Keyboard: 62-key sealed keypad with function keys

Navigation: 4-way navigation diamond, stylus, touch

Size: 5.25 x 10.0 x 1.5 inches

Ingress protection: IP67 waterproof and dustproof

Operating temperature: -22 to 130 degrees F

Drop: Multiple 5-foot drops to concrete

Humidity: Tested to MIL-STD 810F

Vibration: Tested to MIL-STD 810F

Altitude: Tested to MIL-STD 810F

Certifications: FCC Class B, European CE Mark, EN60950, RoHS compliant

Weight: 1.8 pounds (including battery)

Power: BT-H11 3.6V/4,000mAh 14.4 watt-hour NiMH ("10 to 20 hrs."), 10-18V unregulated

Communication: Integrated Bluetooth Class 1 (33 feet); optional 802.11b/g WiFi, GPS, bar code, RFID, data acquisition via sealed expansion pods

Interface: Full-size USB host, Mini-USB client, COM1 (RS232 9-pin)

Price: Monochrome unit starting at US$2,575; color unit starting at US$2,875

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