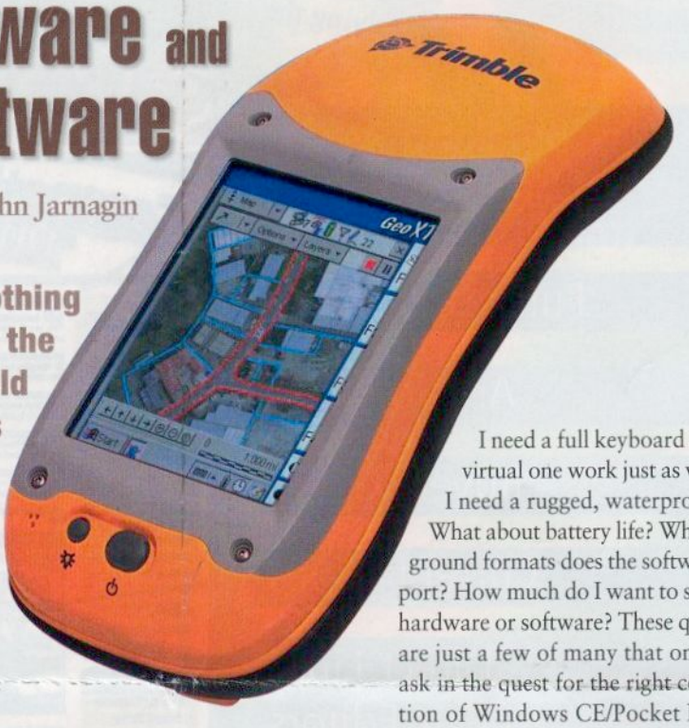
GEOSPATIAL SOLUTIONS
Duluth, MN

MONTHLY 32,087

MAR 2003

Evaluating Windows CE Hardware and Software

John Jarnagin



Tablet PCs are nice, but nothing beats having GPS/GIS in the palm of your hand. For field data collection, today's Windows CE products provide all the power you need at a size you can handle.

As budgets shrink and workloads increase, employees are expected to be more efficient and multitask in the workplace. Why should we not expect the same for field data collection equipment? With Windows CE hardware and software, geospatial professionals can extend workplace efficiencies to the field by using a single handheld for such tasks as GPS data collection, editing files, GPS/GIS data maintenance, working with spreadsheets, and e-mailing data.

Windows CE is Microsoft's open-architecture operating platform for handheld mobile devices. It also provides the underlying structure to Microsoft Pocket PC interface, which is simply a version of Windows CE customized for PDAs with integrated sync tools and contact/calendar functions. And though the Tablet PC has received more press lately (for a guide to Tablet PCs on the market, see "Tablet PCs for Mobile GIS," *Geospatial Solutions*, February 2003), Windows CE/Pocket PC devices offer many advantages over Tablet PCs and laptops because of their small size. The smaller form factor of Windows CE equipment is easier to handle, and enables users to carry just a subset of data to the field, not the whole database. And, Window CE–optimized software takes less processing power, eliminating the down time waiting for applications to load.

Windows CE/Pocket PC devices also comprise a more mature market, technologically speaking. There are literally hundreds of different hardware and software options available for the CE platform. Of course, the tasks one needs to accomplish in the field will dictate the Windows CE/Pocket PC hardware/software solution: How much memory do I need? Is a color screen important? Do I need a full keyboard or will a virtual one work just as well? Do I need a rugged, waterproof unit? What about battery life? What background formats does the software support? How much do I want to spend on hardware or software? These questions are just a few of many that one might ask in the quest for the right combination of Windows CE/Pocket PC software and hardware.

To help you sort out the available options, we at Electronic Data Solutions have compiled information about several major Windows CE-based hardware devices marketed to geospatial users as well as selected standalone GIS software products (see the "Windows CE Hardware" and "Windows CE GPS/GIS Software" tables on pages 42 and 43). Jeff LeProwse, the technical support department manager for Electronic Data Solutions, collected the specifications and tested and reviewed the CE products listed in the tables. Notably, the tables only include products actually tested and reviewed by Electronic Data Solutions (see "Editor's Note"). In addition Electronic Data Solutions only tested Windows CE/Pocket PC hardware and software capable of providing an integrated GPS/GIS field data collection solution. In other words, the hardware reviewed contains or integrates with a GPS module, and the standalone Windows CE-based GIS/mapping software is capable of plotting

John Jarnagin is a GPS/GIS specialist at Electronic Data Solutions (www.elecdata.com). He is a graduate of Utah State University with a B.A. in Geography, with an emphasis in GIS. John has worked in the GPS/GIS field for seven years.

or otherwise interacting with real-time GPS data from the hardware units.

Hardware choices

The Windows CE–based hardware we assessed includes the Allegro DOS/CE and Allegro CE from Juniper Systems (www.junipersys.com), the TSCe and GeoExplorer CE from Trimble (www.trimble.com) and the iPAQ from Hewlett-Packard (www.hp.com).

The Allegro CE units are highly ruggedized and sealed against water submersion and dust. The units are also expandable with pods that can be permanently attached with no external cables to get in the way. An available GPS pod contains a Trimble Lassen eight-channel GPS receiver.

The Trimble TSCe is another rugged data logger. It is also rebranded and sold as the Ranger from Tripod Data Systems (www.tdsway.com) and its At Work Computers (www.atworkcom.com) division. The unit integrates via a cable with Trimble's 12-channel GPS Pathfinder Power, Pro XR, and Pro XRS pole-mounted GPS receivers.

Trimble's two GeoExplorer CE systems contain integrated GPS receivers. The GeoXT model is a 12-channel, submeter system that incorporates Trimble's Everest multipath rejection technology for challenging conditions, such as heavy tree canopy and canyons. The GeoXM is an eight-channel receiver achieving 2–5-meter accuracy (postprocessed).

The Hewlett-Packard iPAQ is the only nonrugged Pocket PC device we reviewed. An optional expansion pack enables users to add PC-card-based GPS receivers, such as Trimble's new PC-card receiver, to the units.

Mapping options

The Windows CE–based GIS software we reviewed includes ESRI's (www.esri.com) ArcPad, Trimble's TerraSync, and Tripod Data Systems' Solo CE.

ArcPad is the Windows CE/Pocket PC relative of ArcView. ArcPad has several customization options, and users can design data entry forms, drop-down menus, radio boxes, required fields, and so forth, using the desktop ArcPad Studio application. ArcPad works directly in shapefile format

Tripod Data Systems' New Recon Handheld

Editor's Note

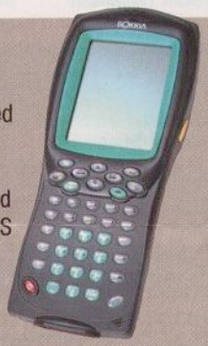
The information compiled in this article should not be considered a comprehensive list of the Windows CE/Pocket GIS hardware and software on the market. Only products actually reviewed by Electronic Data Solutions appear in the article.

Products not covered by the review include, on the hardware side, Sokkia Corporation's (www.sokkia.com) SDR8100 handheld, Panasonic's (www.panasonic.com) Toughbook 01, and Symbol Technologies' (www.symbol.com) PPT 2800 systems, which can integrate with a GPS module from LinksPoint (www.linkspoint.com). The hardware review also did not discuss Tripod Data Systems' (www.tdsway.com) Recon Windows-CE handheld, which was announced just as this article went to press.

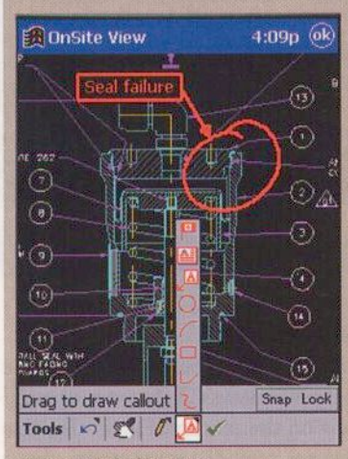
In terms of standalone GIS software, Electronic Data Solutions did not review Autodesk's (www.autodesk.com) OnSite View, Intergraph Mapping and Geospatial Solutions' (www.intergraph.com/gis) IntelliWhere (www.intelliwhere.com) On Demand, Pocket Systems' (www.pocket.co.uk) Pocket GIS, Sokkia's iMap, or LinksPoint's Field Data Collector program. Autodesk's OnSite View, LinksPoint's Field Data Collector, and IntelliWhere's OnDemand are designed for Pocket PC devices and can integrate data from GPS receivers in various formats. Sokkia's iMap and Pocket System's Pocket GIS are general Windows CE programs and also accept data from GPS receivers. Notably, Sokkia and LinksPoint sell GPS units for integrating with their hardware and software offerings.

It's also worth re-emphasizing that all the GIS software discussed in the article and mentioned in this sidebar are standalone products. There are many Web GIS solutions available that rely on server technology to supply maps via the Windows CE Internet browser (known as Pocket Internet Explorer).

To find out more about the products not discussed in the review, as well as Web GIS server technology products, be sure to look for information in future issues of *Geospatial Solutions*. — **Jim Engelhardt,** Managing Editor.



Sokkia's SDR8100



Autodesk's OnSite View

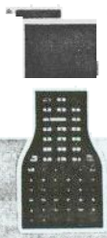
IntelliWhere's OnDemand

Symbol Technologies' PPT 2800 with LinksPoint GlobalPoint GPS and Field Data Collector software

Pocket System's Pocket GIS

Windows CE Hardware





	Allegro DOS/CE	Allegro CE	TSCe	GeoExplorer CE	iPAQ
Processor	486 AMD 100 MHz	Strong ARM 206 MHz	Strong ARM 206 MHz	Strong ARM 206 MHz SA-1000	Strong ARM 206 MHz
Operating System	Windows CE/MS DOS	Windows CE	Windows CE	Windows CE	Pocket PC
Memory/Storage	16 or 32 MB RAM	32 or 64 MB SDRAM	64 MB RAM	32 MB RAM	64 MB RAM 32 MB Flash ROM
Nonvolatile Storage	24 MB	32–256 MB	128 MB	128 or 512 MB	N/A
PC Card Slot	Yes	Yes	No	No	No
Size	10 × 5.25 inches	10 × 5.25 inches	10.2 × 5.1 inches	8.5 × 3.9 inches	5.1 × 3.3 inches
Weight	1.78 pounds	1.84 pounds	2.18 pounds	pounds	5.8 ounces
Operating Temperature	–22 to130 °F	–22 to 130 °F	14 to 140 °F	14 to 122 °F	32 to 104 °F
Water Resistant	Submerged in 2 feet of water for 2 hours	Submerged in 2 feet of water for 2 hours	Withstands accidental immersion	Yes	No
Shockproof	Withstands drops of 5 feet on hard surface	Withstands drops of 5 feet on hard surface	Withstands drops of 4 feet on hard surface	Shock and vibration resistant	No
Display Resolution	320 × 240 pixels	320 × 240 pixels	320 × 240 pixels	240 × 320 pixels	240 × 320 pixels
Viewing Area	3.3 × 2.5 inches	3.3 × 2.5 inches	3.1 × 2.5 inches		2.25 × 3.0 inches
Color Screen	No	No	Yes	Yes	Yes
Display Light	Yes	Yes	Yes	Yes	Yes
Display Heater	Yes	Yes	No	No	No
Keyboard	Yes	Yes	Yes	No	No
Battery	NiMH, 3800 mAh	NiMH, 3800 mAh	NiMH, 3800 mAh	Lithium ion	Lithium polymer
Battery Life	12–30 hours	12–30 hours	12–30 hours	8–21 hours	3–6 hours
Communication Ports	Two 9 pin RS-232	Two 9 pin RS-232	9 pin RS-232, 26 pin multiPort	USB, optional DE9 serial clip adapter	Expansion pack connector
Infrared Port	Yes	Yes	Yes	No	Yes
Docking Cradle	No	Yes	No	Yes	Yes

and features user-controlled symbology.

Trimble's TerraSync Professional for Windows CE is a data collection and data maintenance software package designed to work with the company's Pro XR, Pro XRS, Pro XL, Pocket GPS, Pathfinder Power, and GeoExplorer CE receivers, as well as with Juniper's Allegro CE devices equipped with a GPS pod. Trimble also offers a lower priced version of TerraSync (Standard edition), but it can only be used for collecting new GIS data, as opposed to editing existing data dictionaries.

Tripod Data Systems' Solo CE is a very versatile Windows CE GIS/mapping software. It can accept position input from multiple devices (GPS and laser rangefinders, for example) from various vendors. Users can create custom data collection forms with no additional software as well as define their own symbology, menus, toolbars, and map display options. It also contains enhanced grid generation, measuring, and calculating tools, and natively exports several data formats without supporting desktop software.

Hands-on solution

It's ultimately up to end users to decide among the Windows CE–based geospatial solutions on the market. Hopefully, this overview has provided some clarity about different Windows CE/Pocket PC field data collection systems available and will help you get your hands on a mobile solution that can truly increase field mapping and data collection efficiencies.

Windows CE GPS/GIS Software

	ArcPad 6.0.1	TerraSync 2.21		Solo CE 3.1
		Professional	Standard	
Windows CE Version Support	2.11, 2.12, 3.x	2.11, 2.12, 3.0	2.11, 2.12, 3.x	2.11, 2.12, 3.x
Software Features				
In-Field Map Display	Yes	Yes	Yes	Yes
Background Vector Map Display[1]	Yes	Yes	No	Yes
Vector Format	SHP	SSF, SHP	SSF	SHP, MID/MIF, DXF, DGN
Background Image Map Display	Yes	Yes	No	Yes
Background Image Format	JPEG, MrSID, BMP, CADRG, PNG	JPEG, MrSID, BMP	N/A	JPEG, TIFF, SIF, DOQ
Coordinate Systems	Lat/Long, UTM (State Plane), others	Lat/Long, UTM (State Plane),others	Lat/Long, UTM (State Plane), others	Lat/Long, UTM (State Plane), others
Digitizing Capability[2]	Yes	Yes	Yes	Yes
Direct Export Other GIS Formats	No	SHP	SHP	SHP, DXF, ASCII, TDS CR5
Export Formats Supported with Office Software[3]	SHP, DXF, MIF, ESRI Generate, APRS, WMF, EPS, PDF, CGM	PC/UNIX ArcInfo,SHP, MIF, DXF, DGN, MOSS, GRASS, IDRISI, MGE, ASCII, DBF	PC/UNIX ArcInfo, SHP, MIF, DXF, DGN, MOSS, GRASS, IDRISI, MGE, ASCII, DBF	Many others
Export Different Coordinate System[3]	Yes	Yes	Yes	Yes
Customize User Interface	Yes	No	No	Yes
External Non-GPS Sensor Support	Yes	Yes	No	Yes
Data Maintenance				
Update Attributes	Yes	Yes	No	Yes
Update Positions	Yes	Yes	No	Yes
Filtering & Sorting	Yes	Yes	No	Yes
Status Flags (New, Imported, Updated)	No	Yes	No	No
GPS Support				
GPS Navigation	Yes	Yes	Yes	Yes
Close-Up Navigation Screen	No	Yes	Yes	Yes
Feature Collection	Yes	Yes	Yes	Yes
Attribute Collection	Yes	Yes	Yes	Yes
Data Dictionary Support	No	Yes	Yes	Yes
Real-Time DGPS[4]	Yes	Yes	Yes	Yes
Postprocessed GPS[5]	Yes	Yes	Yes	Yes
Postprocessed Real-time	Yes	Yes	Yes	Yes
Receiver Control	Yes	Yes	Yes	Yes
Loss of DGPS Warning	Yes	Yes	Yes	Yes
Continue (Nest Point)	Yes	Yes	Yes	Yes
Repeat Feature	No	Yes	Yes	Yes
Supported GPS Protocols	NMEA,TSIP, Delorme binary, Rockwell binary	TSIP	TSIP	NMEA, TSIP
Laser Rangefinder Interface (for creating GPS offsets)	No	Yes	No	Yes
Hyperlinking notes, drawings, voice, and photos to features	Yes	Yes	No	Yes
Velocity Data Filter	Yes	Yes	Yes	Yes
Segment Line Features[6]	No	Yes	Yes	No
Vertex/Point Averaging[7]	Yes	Yes	Yes	Yes
WAAS Support	No	Yes	Yes	No

1. ArcPad and Solo CE support multilayer environments. TerraSync Professional supports a single vector/raster background layer.
2. The ability to create positions for a feature by selecting a location on the map.
3. Exporting to other formats or coordinate systems requires ArcView in the case of ArcPad, Solo Office for Solo CE, and Pathfinder Office for TerraSync.
4. ArcPad can use any receiver that outputs the NMEA message, regardless of whether it has real-time corrections or not. TerraSync only functions with Trimble GeoExplorer CE, ProXRS, ProXR, ProXL, Power, Pocket and Allegro GPS Pod receivers. Solo CE supports real-time DGPS receivers that output NMEA or TSIP standard protocol.
5. TerraSync uses Pathfinder Office and base station data to postprocess GPS and DGPS positions. Solo CE can store data for postprocessing from Trimble Pathfinder series or Ashtech receivers. Postprocessing in ArcPad 6.0.1 requires buying Trimble's GPSCorrect software, using a Trimble Pathfinder receiver, and Pathfinder Office or Express.
6. The ability to record line features as joined segments having different attribute values (for example, a road that is paved and unpaved in different sections).
7. The capability of averaging multiple point positions or multiple vertex positions in a line/area to produce higher data accuracy.