



# INTEGRATED CONCEPTS

**A new philosophy coupled with a new product launch drives Leica Geosystems into the future.**

**by Leica N. Brown**

“Working Together” is a phrase that Leica Geosystems plans to make more than just a tagline. The introduction of the phrase partners its recent product launch, the Leica System 1200, but is intended to be a long-term vision.

“Our primary purpose with this system is to turn our customer focus into a real design concept,” says Andrew Hurley, director of surveying systems, adding that the company has taken on more of a client satisfaction approach to its way of business, from R&D to product release to support to enhancements.

Beginning with a plan a number of years ago to work together with its customers, Leica created a global-wide system in which all its national divisions could reap benefit from the others’ research. The company composed and sent out a global survey to its customers to find out exactly what they wanted in a surveying instrumentation provider and what they sought in equipment and software. The survey revealed many specific categories for Leica to focus on; further inspection revealed that 50 percent of the results were company related and 50 percent were product related. This led company managers to focus on both areas.

Where did they start? One part in the process, centering on customer product offerings, included the recognition that surveyors benefit from having both total stations and GPS tools in their inventory. Leica addressed this issue by deciding to combine the two technologies along with software and also the most imperative accessories. It was a good idea but not an effort to be accomplished overnight. Four years in the planning, Leica considered every aspect for such a system, focusing on an especially important one: building a product that could be enhanced in the future without many logistical complications or complexities. This would benefit both the customer and the company for years.

The Leica System 1200, which combines GPS technology with total station instrumentation, and field and office software all in one single system, is not just old technology supplied in a new way, Hurley advises. It is, rather, a single system that has been designed from the ground up. Why start from scratch? In short, because this is to be part one of a series, a mere stepping-stone. For the long term, this means that Leica has created a system in layers, so it can present enhancements and additions much more seamlessly rather than having to shave down to the core



*“Coming together is a beginning, keeping together is progress, working together is success.”*

*- Henry Ford*



components. What are the components of the Leica System 1200? Here's a closer look.

### **Interchangeable Technology**

The Leica System 1200 integrates the new “Working Together” Leica philosophy. The main foundation for the system is its newly trademarked X-Function Integrated base concept, a concept Hurley says will be applied to all future Leica releases. In the Leica System 1200, the X-Function Integrated concept allows the user to toggle between terrestrial positioning system (TPS) technology, that is, total stations, and GPS whenever necessary. It is capable of such a resilient move because the system's TPS and GPS tools possess an identical user interface, identical accessories, identical database and a common office software. What's more is that the system's Energy 1200 One Power Concept requires only one set of batteries for one full working day and uses a single battery charger for both TPS and GPS. This, Hurley says, is a minimum investment for the user, extending the lifecycle of the system and providing exceptional output and efficiency.

Now, with TPS and GPS technology in one system, Hurley says the question for a surveyor becomes “Do I have sky or don't I?” Either way, surveyors have the tool needed to work productively and efficiently.

The software works on the same integrated principle with one comprehensive office support package. System 1200 uses the same database for both TPS and GPS data, facilitating transparent data transfer between the two technologies. System 1200 software, based on Windows multi-tasking environment Leica Geo Office (LGO), has the same displays and operation, identical functions and routines, and common applications programs. From this standard Leica software environment, data from total stations, GPS and/or digital levels can be imported for processing, to perform quality control, and to export data and generate reports. Automatic reports can be generated at any time, lessening the need for excessive Excel spreadsheets; users can see only what they want to see at any time.

Before heading off to the field, System 1200 users can manage and prepare codelists, coordinate systems, design data, and projects in LGO. Users no longer need to use different software to support the different sensor types. LGO is also the only software needed for visualizing, processing and adjusting of data before it is exported to a CAD package, and LGO exports to virtually any CAD software package, including Autodesk AutoCAD and Land Development Desktop and Carlson SurvCAD. Using ASCII format, or via the GIS/CAD export option, users can export data to their CAD software. Users can also convert their data to the target CAD format directly in the field and then transfer it to

the CAD software. And data managers who cringe at the thought of endless conversions will be thrilled with the various customization options using System 1200. Users can write their own formats using a standard supplied tool within the system.

### **Productivity and Profitability**

The Leica System 1200 promises to answer the productivity desires of surveyors, thus increasing company profitability. The application suite is accessible at any time to the user from anywhere during a survey to perform such tasks as COGO routines, reference line stakeout, transformation of coordinate systems and data management. Advanced surveying tasks include DTM stakeout, roading and sets of angles routines, measuring angles and conducting distances in Face I and II, and traversing to check the positions of existing points or establish new ones.

With the ability to go from static to RTK GPS, to using total stations or digital levels, users can effectively guarantee productivity in the field, no matter what type of tool is needed. The flexibility of System 1200 allows users to use the system on a pole (good for stakeout), in a minipack (good for long hours), on a tripod or even on a construction machine, survey boat or aircraft (for geodetic control and reference stations). Users can connect a laser rangefinder to the GPS1200 receiver to survey inaccessible objects.

With many options in one system, Leica System 1200 users can potentially reduce their costs from buying many different kinds of equipment and increase profits by bidding on jobs no matter what technology is needed. Leica also promises that time and money can be saved in the learning curve since initial training encompasses the entire system.

### **Confidence in Accuracy and Reliability**

System 1200 offers four different GPS1200 receivers for users to choose from, ranging from the Leica GX1230 universal receiver (with 12 L1 channels and 12 L2 channels, plus full RTK and DGPS capability and ability to function as a reference station or rover), to the Leica GX1220 and Leica GX1210 receivers for data logging, to the Leica GRX1200 Pro as a CORS station and as an RTK and DGPS data logging unit with Ethernet connectivity.

To include the best GPS measurement engine for the system's GPS1200 family of receivers, Leica outsourced the creation of this component to NovAtel, a provider of precise global positioning and augmentation technologies, with whom Leica established a strategic alliance several years ago. Leica sought its GPS end to have a smaller measure-



ment engine, and one that will be designed to take advantage of the upcoming L2C and L5 satellites (available in 2008 and 2009, respectively). "They have the technology link that Leica can be confident in," Hurley says. Even under difficult conditions GPS 1200 has proven to deliver accurate positions with a reliability of 99.99 percent.

The TPS1200 instruments are available in four different levels of angle accuracy (1", 2", 3", 5"), and also with the RX1220 remote control unit. Although the primary focus of the RX1220 control unit is for robotic use of TPS1200, it functions just as well with GPS1200. Users need just plug and play; RX1220 automatically recognizes the instrument type, another example of X-Function.

The TPS1200 total station family possesses PinPoint reflectorless EDM technology, which claims to accurately measure distances, without a prism, up to 500 m. PinPoint technology comes in two versions: R100 and R300. The R100 measures distances in reflectorless mode to 100 m to the Kodak grey card, 18% reflectivity side, and farther to more reflective surfaces (170 m); R300 measures distances in reflectorless mode to 300 m to the Kodak grey card, 18% reflectivity side, and farther to more reflective surfaces (500 m). Both versions are FDA-approved laser class 3R.

As an optional TPS feature, PowerSearch maximizes productivity when operating in robotic mode by ensuring that when the line of sight to a prism is obstructed and then cleared, the prism can be found instantly. With the press of one button (or automatically if configured) the instrument scans for a prism. PowerSearch rapidly finds the prism with ATR (Automatic Target Recognition), taking over and conducting the fine pointing—all fully automated. PowerSearch operates with all standard prisms.

The GPS component of System 1200 incorporates many new advances, including satellite acquisition within seconds, tracking in difficult conditions (e.g. low elevation satellites,

among obstructions), suppression of multipath, faster resolution times, and according to Hurley, a new standard in RTK reliability. Hurley also says that SmartTrack technology provides users with the confidence of top GPS performance in the toughest of environments. SmartCheck describes the new RTK processing algorithms at up to 20Hz that translate the measurement delivered from the SmartTrack measurement engine to coordinates used for survey activities within seconds. SmartCheck utilizes Leica's unique onboard integrity monitor to permanently check, ensuring that reliability is never compromised. The SmartTrack measurement engine and antenna in the GPS1200 receivers provide excellent measurements used by the receiver's SmartCheck processing algorithms to increase the number of points that can be measured per day up to 30 km from a base station with 99.99 percent reliability. Through SmartTrack and SmartCheck GPS technology, which provides optimal tracking of both the L1 and L2 signals, confidence is offered to the user in the areas of accuracy and reliability.

### Rugged and Ergonomic

Leica expects System 1200 to meet or exceed surveyors' expectations for accuracy, resistance to temperature and humidity, and the ability to withstand rugged field conditions. The system meets the International Organization for Standardization (ISO) standard 9022 and MIL-STD (military standard) 810F. Hurley cites that all components of the system comply with the standards, including the survey grade choke-ring antenna. The instrument withstands a drop of 1.5 m and has an IP67 rating for rain, sand, dust and wind. According to the Ingress Protection (IP) specification, which rates on a scale of 0-6 for protection against solid objects, such as dust (the first number) and 0-8 for protection against liquids (the second number), the IP67 rating of the System 1200 is a near perfect grade for environmental protection from enclosures on electronic equipment. This rating indicates that it is nearly impenetrable from dust and immersion in water up to 1m depth, and able to withstand most any surveyor's work environment.

And since surveyors seek flexibility, less weight and more comfort in their setups, the pole setup offered with System 1200 is quite lightweight: the robotic rover pole is 3.2 lbs and the RTK rover all-on-a-pole weighs 8.01 lbs. The system's ATR ability helps to relieve operator strain and fatigue so the surveyor can focus on his/her work without discomfort or exhaustion.

### Additional Features and Applications

System 1200's common office software, LGO, includes extended functionality for coordinate transformations, GPS post-processing, level data processing, network adjustment and GIS/CAD export. LGO includes, for example, the new RoadRunner software suite for both GPS and TPS, designed to stake out roads and check all types of alignments from simple centerlines to the most complex designs. For post-processing applications, the LGO software supports all Leica

GPS receivers (System 200, 300, 500 and 1200) as well as the industry standard RINEX format.

Users can bring in maps in DXF format into System 1200 by converting the files to a field job using the LGO "Design to Field" converter and visualizing the map in the field. The large map view display graphically shows the user exactly what has been surveyed and staked out, and what remains to be done. Users can also automatically create points at the vertices of objects in the DXF file, such as building corners, allowing for the stakeout of these vertices. The standardized operating concept is also identical on the Leica RX1220 remote control unit, making it capable for one-person operation.

System 1200 can also be utilized for machine guidance applications. The TPS1200 promises to exhibit excellent tracking and ATR performance, and the TPS1200 search routines ensure that the prism is quickly found after line of sight obstructions; GPS1200 SmartTrack delivers excellent satellite re-acquisition after obstructions to signals. Favorable performance is ensured from measurement updates of 20Hz with negligible latency. And in typical high-vibration environments like construction sites, System 1200's SmartTrack and SmartCheck is said to deliver continuous accurate positioning. The GPS unit of System 1200, GPS1200, has been built to top rugged specifications to withstand tough conditions and high vibration and shock environments.

System 1200 also supports third-party devices including data collectors, tilt sensors for machine control and meteorological devices using the same communication protocols as supported with Leica's System 500 GPS and TPS1100. In most cases, users can just plug in and go, although some commands will require the purchase of a firmware option for full functionality.

GPS1200 supports several communication devices, including Pacific Crest and Satel radios, and GSM, CDMA and TDMA modems from Ericsson, Siemens, U.S. Robotics and Wavecom. Other communication devices are supported via the optional Bluetooth housing, including compatibility with PDAs, cell phones and Leica's DISTO Plus laser distance meter. GPS1200 supports both VRS and FKP formats for wide-area RTK operation.

By providing a single integrated system that enables seamless transitions from using global positioning technology to terrestrial operations and back, along with a full suite of software functions, Leica Geosystems strives to provide a universal system that will create an outline for its future, the future of its customers and a future of advanced products. 🌐

*Shipments of the first Leica System 1200 units began in March. If you utilize System 1200 in your work, let us know about it. E-mail [brownl@bnpmedia.com](mailto:brownl@bnpmedia.com).*

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