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LEICA SR530 Geodetic RTK Receiver

SR530

SR530 Dual-Frequency, Geodetic, Real-Time-Kinematic Receiver
SKI-Pro Professional Office-Support Software
GPS Surveying – System 500

Leica
Geosystems

High technology

- ClearTrak™ dual frequency
- On-board RTK
- Perfect tracking
- Jamming resistant
- Multipath mitigation
- High update rate 10Hz
- Low latency < 0.03sec

Highest accuracy

- Fast, reliable ambiguity resolution on the fly
- cm-accuracy long-range RTK
- 5mm + 0.5ppm rapid static
- 3mm + 0.5ppm static

Modular hardware

- Small, light, rugged
- Easy to use
- Optional terminal
- Radio modem, GSM phone
- Choice of antennas
- Plug-in batteries
- PCMCIA flash cards

All measuring modes

- Real-time kinematic
- Static, rapid static
- Stop & go, kinematic
- On the fly
- DGPS
- Navigation
- Post processing

Easy interfacing

- Four communication ports
- NMEA output
- ASCII input
- PPS output and event input
- OWI commands

All applications

- Geodetic control
- Photo control
- Detail and topo surveys
- Cadastral surveys
- Seismic surveys
- Construction
- Engineering
- Setting out
- Mining
- Machine control
- Hydrographic survey
- GIS mapping
- Reference stations
- Monitoring
- Geodetic networks
- Aerial photography

SR530 - geodetic, real-time receiver 12L1 + 12 L2, C/A-code, P-code, RTK



SR530 – fast, accurate, efficient GPS surveying RTK, stakeout, data logging, and much more . . .

Top of the range

The SR530 is a 24-channel, dual-frequency GPS receiver of the highest accuracy and with on-board RTK. The top model of Leica Geosystems' System 500 range, the SR530 is light, rugged and easy to use. This high-tech receiver combines outstanding performance and productivity with exceptional economy.

Total solution

Although designed primarily for high-accuracy GPS surveying, the SR530 is amazingly versatile and can be used for almost any task: as a real-time rover or reference, for stake out, geodetic survey, monitoring structures, and even as an OEM module delivering a continuous stream of centimeter-accuracy coordinates.



Reference stations and geodetic survey

Use at permanent and temporary reference stations for logging data and transmitting RTK and DGPS. Measure in static and rapid-static modes for geodetic survey.

Real-time rover

RTK rover with radio modem or GSM phone. Use for survey, data acquisition, stakeout etc. Work in WGS84 or local coordinates. Input point numbers, codes and attributes. Utilize on-board and optional programs for special applications.

Measure and compute hidden points

Use a Leica DISTO, or Leica Vector or any other laser rangefinder to measure to (or even from) inaccessible objects. The SR530 RTK rover computes and stores the coordinates directly.



SR530 – incredibly versatile, does almost everything

Interfaces easily with all types of devices



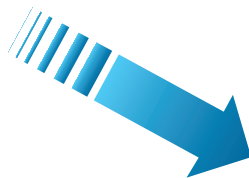
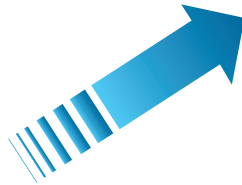
Interfaces to PC's and software

Transfer data to and from PC's, either directly or via PCMCIA card or via a modem. Transfer an entire survey in the required format to CAD and mapping software, either directly from the SR530 or via SKI-Pro software.



Compatible with total stations

Transfer coordinate and data files in the required formats from the SR530 RTK rover to Leica (and even to some non-Leica) total stations. Combine GPS and TPS surveying.



Connects easily to other devices

Connects easily to PC's, penpads, echo sounders, aerial cameras, meteorology sensors, tilt meters etc. Outputs NMEA messages, receives and logs ASCII strings.

Communication ports easily configured. Optional pps output and event input. If you have an unusual application, you can even write your own, task-specific receiver-control software using Leica OWI Outside World Interface commands.



SR530 – top technology Yet very easy to use

ClearTrak™ receiver technology



The SR530 has Leica Geosystems' ClearTrak™ technology for best signal-to-noise ratios, resistance to jamming and multipath mitigation. ClearTrak™ guarantees fast satellite acquisition and reliable tracking, even to low satellites in poor conditions.

Dual frequency

Dual-frequency is essential for high-accuracy results, reduction of ionospheric influences, short rapid-static measurements and fast ambiguity resolution on the fly.

- L1: full-wave carrier phase, C/A narrow code and precision code
- L2: full-wave carrier phase, P-code or P-code aided under AS

Independent measurements

Fully independent L1 and L2 tracking loops ensure high-accuracy code and full-wave carrier phase data. If the P-code is encrypted, the SR530 switches to a patented P-code aided tracking that provides a decisive 13db advantage over conventional cross correlation.

The SR530 always provides precise measurements, whether AS is on or off.

Tracks in difficult environments

Because ClearTrak™ provides very strong signals, suppresses multipath to almost negligible levels and shields against interference, the SR530 will measure in the vicinity of trees and obstructions and in areas where other receivers are often jammed.

Fast, accurate RTK



New, self-checking real-time algorithms combine with ClearTrak™ technology to provide the best possible RTK: fast ambiguity resolution on the fly, centimeter accuracy, long range, and high reliability.

Integrity monitoring

A unique, multi-tasking integrity-monitoring system ensures the highest possible degree of reliability.

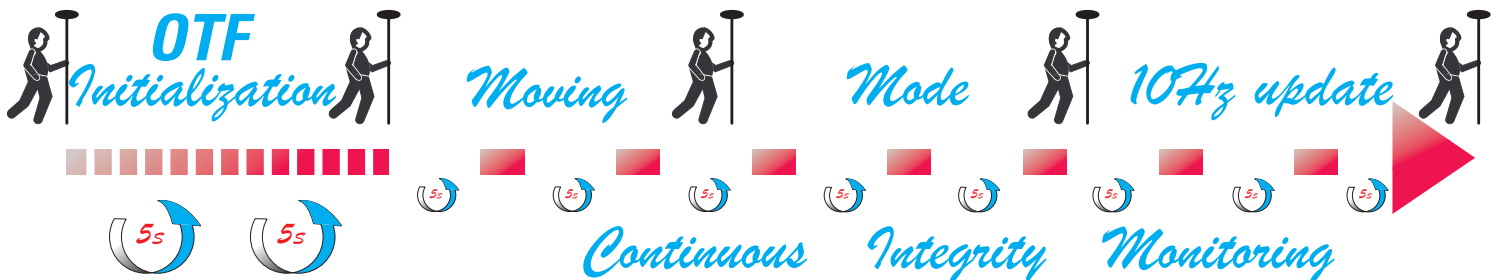
Each initialization typically takes only 10 seconds and is the result of two completely independent on-the-fly ambiguity resolutions.

Continuous checking

As soon as initialization is complete, moving-mode centimeter-accuracy positions are available at rates up to 10 Hz. The integrity-monitoring system continues in the background computing new, fully independent ambiguity resolutions every few seconds to check the displayed positions.

Totally reliable

Reliability is better than 99.99% for lines up to 15km and 99.9% for long lines up to 30km. In the unlikely event that an error should occur, the continuous integrity monitoring will detect it almost instantly. With SR530 RTK, nothing is left to chance. You can be sure that your results will be correct, all the time.



TR500 terminal



The terminal is extremely versatile. It plugs directly into the receiver or connects to it by a cable; it can be attached to the pole or held in the hand.

Display and keyboard

The terminal has a large display and full alphanumeric QWERTY keyboard for the input of point identifiers, codes, attributes etc.

Satellite tracking, receiver, recording, power-supply status, real-time positions and other information are displayed.

Measuring, recording and RTK sequences can be defined.

Two-level operating system

The operating system has two levels: Standard for first-time users and normal work, Advanced for experienced operators and special applications.

Function keys and user-definable keys allow fast panel changes and function selection.

Settings for interfaces, modems, NMEA messages etc. are easily made.

SR530 without terminal

The SR530 can also be used without a terminal. It will track satellites, log data, transmit or receive via a radio modem, and even compute and record real-time positions. LED's show battery, logging and tracking status.

For use as a reference or for measurements at remote sites, it will power up, track, record, transmit and power down at preset times. Sequences can be repeated.

Set it up any way you want

Modular hardware, for every requirement

You can set up the SR530 wherever, whenever, and however you want. You can use it in any way, to suit your individual requirements, preferences and applications.

- With or without a radio modem or GSM phone
- For real time or post processing
- With a standard antenna or a choke-ring antenna
- On a pole as a real-time rover
- On a pole for stop and go and kinematic
- On a tripod as a real-time reference
- On a tripod for static and rapid static
- On a boat for hydrographic survey
- On a vehicle for automatic profiling
- On a bulldozer or scraper for mining and construction
- In an airplane for aerial photography
- With a minipack for GIS and seismic surveys
- On a pillar at a reference station and for monitoring
- Connected to any device such as a PC, penpad, Geiger counter, gas detector, bar-code reader

At a real-time reference, and for static and rapid static

- Either hook the receiver on the tripod leg
- Or put the antenna on the tripod and leave the receiver operating in the case

For a real-time rover, and for stop & go and kinematic

- Either put the receiver in the minipack
- Or have everything on the pole

Pole and minipack

Minipack with SR530, plug-in battery, radio modem, radio antenna:

- 3.7kg on your back

Pole with terminal and GPS antenna:

- 1.7kg with carbon-fiber pole or
- 1.95kg with aluminium pole



Light and easy to carry

Minipack, for minimum weight in your hand

When using a real-time rover for hours on end, you want minimum weight in your hand. Put the antenna and terminal in the minipack. Simply disconnect the cables if you need to put the pole down. On reconnecting, the SR530 starts tracking, fixes ambiguities, and continues exactly where it left off.

All on the pole, for your convenience

If you use a real-time rover for short periods or work where there are walls, fences and obstructions, you may prefer everything on the pole. Just put the pole down whenever you need to, there are no cables to disconnect.

Carbon-fiber or aluminium pole

With System 500, you can even choose the type of pole: 0.7kg aluminium pole or 0.45kg carbon-fiber pole.

For GIS and seismic surveys

Hold the terminal in your hand and put the rest in the minipack (SR530, modem, antenna). It's light, comfortable, convenient. With cm-accuracy RTK and 30cm DGPS, the SR530 is ideal for seismic and GIS work.



All on the pole

SR530 with terminal, plug-in battery, radio modem, GPS antenna, radio antenna.

- Total weight in your hand:
- 3.75kg with carbon-fiber pole
 - or
 - 4.0kg with aluminium pole

SR530 real time: fast, efficient, productive Gives you everything you need

SR530: reference or rover

In real-time surveying, the rover receives data transmitted from the reference, combines it with its own data, and computes position coordinates continuously. The SR530 can be used as a reference or rover.

Radio modem or GSM phone

Connect a radio modem or GSM phone for full RTK capability. Various modems and phones can be used. Satelline and Pacific Crest modems and the Siemens M20T phone fit in a housing that attaches directly to the SR530. Phones incur calling charges but provide better range than radio modems.

Long-range RTK

Maximum range is determined partly by the data link and partly by the ionosphere. With a low-power radio, maximum RTK range is usually about 10km. With a GSM phone or high-power radio, ranges of about 30km are possible in favourable conditions.

10 seconds OTF initialization

The SR530 can initialize on the fly in about 10 seconds. With ambiguities resolved, the rover moves continuously or stops for a few seconds on each survey point. Integrity monitoring ensures centimeter accuracy, all the time.

All formats – fully compatible

As the SR530 will transmit or receive in Leica proprietary, CMR and RTCM formats, an SR530 reference will support all types of rovers and an SR530 rover will work with any reference.

WGS84 and local coordinates

You can work in WGS84 or local coordinates. Transformation parameters are computed directly in the SR530 or transferred from SKI-Pro software.

Depending on the job, the SR530 can compute transformation parameters in three ways:

- Classical: 3D 7-parameter Helmert transformation
- One Step: 2D from WGS84 to grid plus interpolated height datum
- Two Step: combination of Classical and One Step

Ellipsoids, map projections, geoidal models

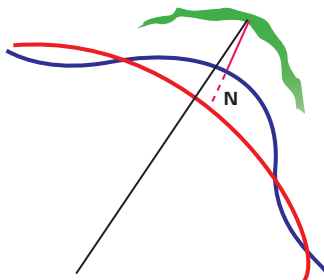
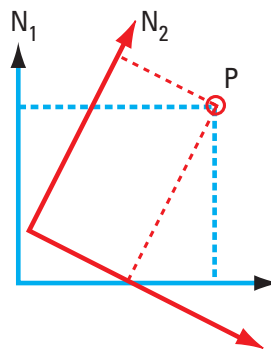
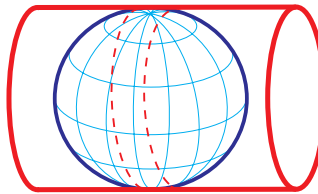
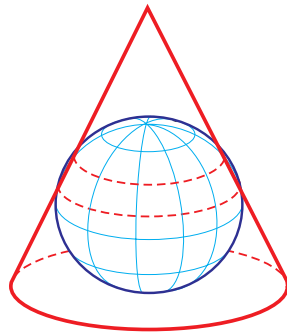
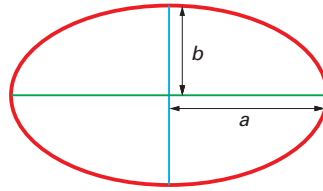
Ellipsoids and map projections can be keyed into the SR530 or transferred from SKI-Pro software. All common projections and many country-specific projections are supported. Geoidal models and country-specific coordinate systems can be transferred from SKI-Pro.

Exactly what you need

SR530 RTK gives you exactly what you need: eastings and northings in the local grid, ellipsoidal heights, and orthometric heights on the local datum. Mean values are computed for points that are measured more than once.

High productivity

Results are available immediately with real time. Survey crews spend more time in the field, less in the office and are far more productive. One person can carry out an entire survey. Several rovers can use the same reference.

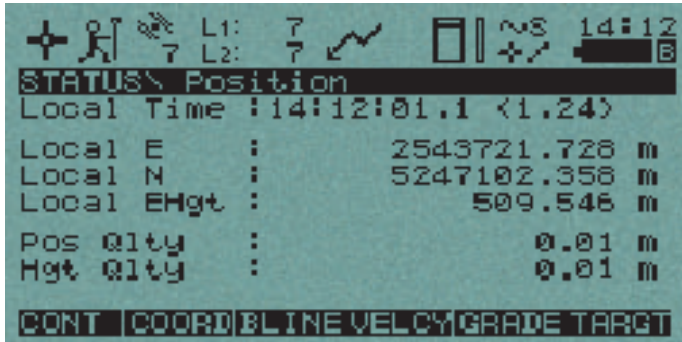


Additional radio or phone

With two devices (2 radios, 2 phones, or 1 radio + 1 phone) connected:

- An SR530 reference can transmit two different formats and/or two different frequencies.
- An SR530 rover can transmit real-time coordinates to a central station.

Centimeter accuracy, real-time power 10Hz update rate with less than 0.05 seconds latency



Quality indicators show accuracy achieved

With quality indicators for position and height displayed, the operator knows that the results are correct. Tolerances can be set in order to be 100% sure that logged positions have the required accuracy.

Log data and positions at rates from 0.1 to 60 seconds

You can record whatever you need: coordinates, raw data, or coordinates with raw data, at rates from 0.1 to 60 seconds. Latency is less than 0.03 seconds.



Point identifiers, layers, codes, attributes

Point identifiers can be entered individually or set to increment automatically with each recording. Feature codes and operation codes are supported. Input is fully automatic. Users can build up layer, code and attribute lists in SKI-Pro software and transfer them to and from the receiver. Notes can be added and recorded.

The coding system is extremely flexible and designed to adapt easily to all types of surveying, mapping, CAD and GIS software.

Output to other devices

NMEA messages provide position and information output to PC's, penpads, navigation and machine-control systems. Coordinates, quality, DOP, satellite and other information can be transferred.

Real-time static: 5mm + 0.5ppm baseline rms Geodetic control, photo control, boundary surveys

Control points can be fixed easily with SR530 RTK. For the best results simply stay on the point for several epochs, the final coordinates will be the mean of all real-time positions. Ambiguity resolution is verified continuously.

Real-time stop and go: 5mm + 1ppm baseline rms For detail and topographic surveys

Move quickly, stopping for a few seconds only on each point. Use for detail, engineering, topographic and cadastral surveys when many points have to be surveyed.

Real-time kinematic: 10mm + 1ppm baseline rms For profiling, hydrographic surveys, machine control

Coordinates are recorded automatically at preset time, distance or height intervals as the rover moves continuously. Individual points can be occupied and recorded. For hydrographic surveys, aerial photography, machine control, profiling and DTM surveys using a vehicle.

Different recording modes

Depending on the job and the way you work, you can select to record in manual, semi-automatic or fully-automatic mode. You can configure the SR530 to work in the way you prefer for your jobs and applications.



Stakeout for position and height With clear graphical display

Stakeout at 10Hz update rate

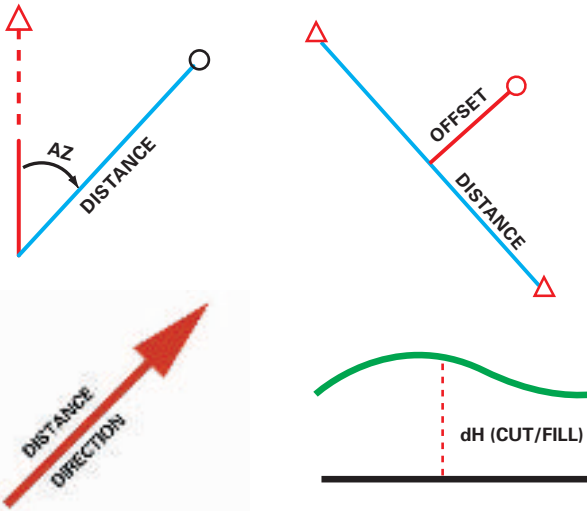
With positions and heights continuously updated every 0.1 second (10Hz), the SR530 is ideal for locating, positioning and setting out to centimeter accuracies.

- Placing markers
- Defining lines
- Determining cut and fill
- Marking levels on stakes
- Positioning structures
- Locating buried objects



Various stakeout modes, graphics with automatic zoom

The graphical stakeout display zooms automatically according to the distance to the target. You can switch between modes as you prefer. Simply follow the direction arrow, or select a reference orientation and use azimuth and distance or distance and offset. The display shows you immediately how far to move, in which direction, and whether to cut or fill. All information is updated continuously.



Powerful database and easy coordinate transfer

Compute the coordinates of the points to be set out in your mapping, engineering or CAD software. Transfer them directly or via SKI-Pro to a PCMCIA card. With the card in the SR530, stake out the road, pipeline, subdivision or drainage channel. The powerful database provides immediate access to all information and displays the differences between design and stakeout coordinates.



Programs for areas, lines, grids, slopes COGO, curves, alignments, terrain models

Compute and stakeout

A series of routines and optional programs provide powerful on-board computation capability. You can measure, compute and stakeout for all types of applications.

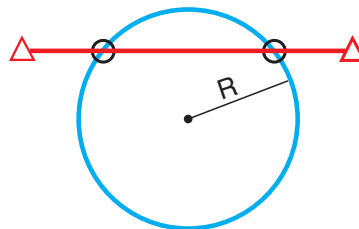
Plenty of reserve power

Stakeout with the SR530 is easier and faster than with other systems. And there's lots of spare memory and processing power for future enhancements.

Standard programs

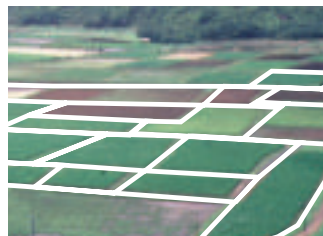
• Coordinate geometry

Use the on-board COGO routines to compute in the field for subdivisions and construction.



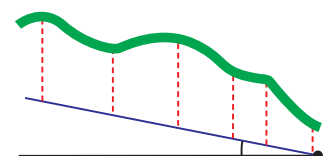
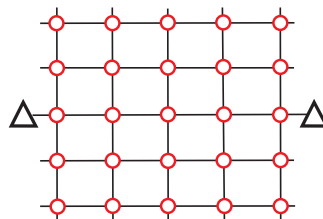
• Areas

Areas are needed when surveying fields or dividing parcels. Survey or define the piece of land. The SR530 computes the area immediately.



• Lines, grids, slopes

With the SR530 you can define and stakeout lines, grids and slopes for construction, drainage, seismic surveys etc.



Optional programs

• Road Plus

Compute and stakeout horizontal and vertical alignments, straights and curves. For road, railway, pipeline construction etc.



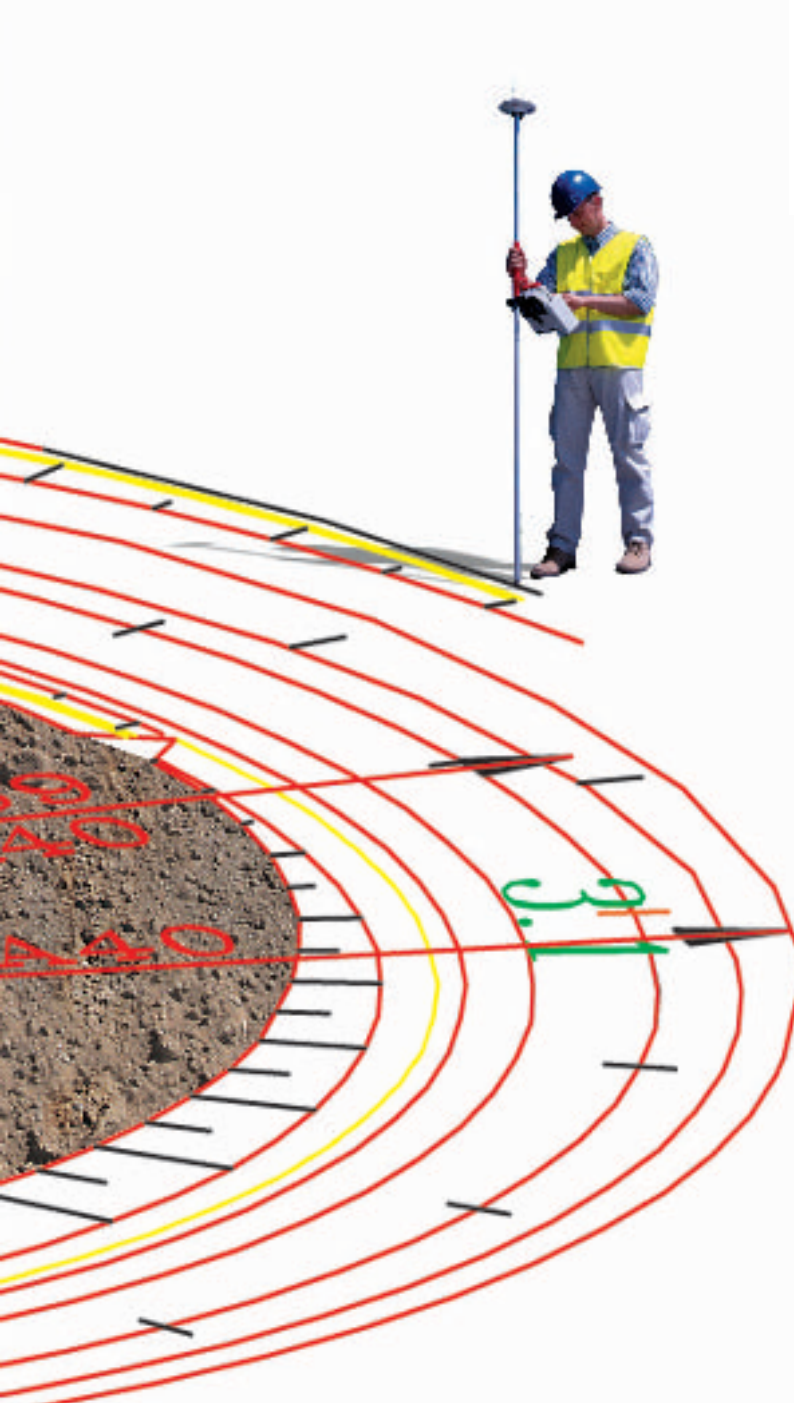
• Quick Slope

Used for setting slope stakes on curved and straight sections. For road construction, grading, opencast mining.



• DTM Stakeout

Transfer a digital-terrain model to the SR530, stakeout the design surface, and monitor progress during construction. For earthworks, land reclamation, mining etc.



Antennas, cards, batteries

Standard survey antenna

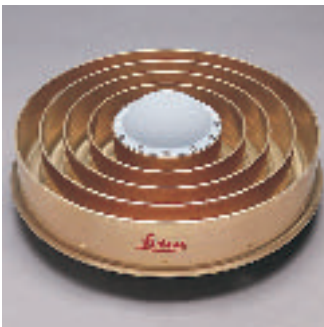
The AT502 is the standard antenna for the SR530. This high-accuracy antenna is small, light, precision-centered and has a built-in groundplane. Orientation is not required.



Choke-ring antennas

Two choke-ring antennas are available. The AT503 is the standard choke-ring antenna for geodetic-measurements and at reference stations.

The AT504 is a special Dorne & Margolin choke-ring antenna. Together with the SR530, it provides data of the highest possible precision for monitoring and scientific studies.



Optional internal memory

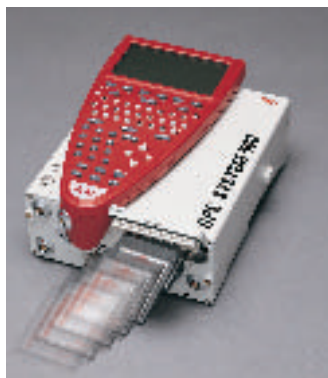
Although most users prefer PCMCIA cards for data recording, the SR530 can be fitted with an internal memory of 8MB or 16MB.

Data recording on flash cards

For recording real-time coordinates and/or raw data, simply insert a PCMCIA flash card into the SR530. Cards of 8MB, 16MB and 96MB are available.

Even an 8MB card holds more than 300 hours of 15-second, 5-satellite dual-frequency data or over 8000 real-time coordinates. An 96MB card can store weeks of static survey information or days of 1-second kinematic data.

Leica Geosystems' flash cards provide huge recording capacity and can be exchanged easily when full. Data transfer from card to PC is fast and efficient.



Equipment case

The entire equipment – SR530, antenna, power supply, terminal, radio and accessories – packs into one small, easy-to-carry transport case.

At a real-time reference, put the antenna on the tripod and leave the receiver operating in the case.

Plug-in batteries

Two Camcorder batteries plug directly into the receiver and can be changed during operation. As the power consumption is only 7W, two plug-in batteries power the SR530 and terminal for about 6 hours.

For continuous operation of a real-time reference or for long-duration static measurements, an external 12V power source can be connected.



Permanent reference stations

The SR530 can be used at a permanent reference station to log data and transmit for RTK and DGPS. A ring buffer allows logging at two different rates.

ControlStation is a PC software for reference-station applications.

DGPS to 0.25m

The SR530 can also be used as a DGPS rover for GIS and seismic surveys. Accuracies as high as 25cm rms are achievable.

Built for field use

Leica Geosystems' System 500 equipment is built to withstand severe environments, rough usage and transport.

Whether you work in heat, cold, rain, snow, dust or sand, you can rely on the SR530.



SKI-Pro: software that works intuitively with your data

Complete suite of programs

The choice of software is equally as important as the receiver hardware. SKI-Pro is a comprehensive suite of programs that runs on 32-bit Windows™ 95, 98, NT and 2000 platforms and the perfect complement to SR530 receivers.

SKI-Pro: Professional Office-support software

Processes all types of GPS data: dual frequency, single frequency, code, phase, static, rapid static, kinematic, on the fly. Imports real time data and combines real-time and post-processed results.

Easy to learn and use

As SKI-Pro is based on an intuitive graphical interface within a standard Windows™ operating framework, it is easy to learn and use. All components have a uniform appearance and interact seamlessly in a multi-tasking environment.

A powerful data base ensures effortless data handling and project management. Results are in WGS84 and local coordinates and can be exported to a variety of systems. Users can define their own input and output formats.

Everything you need

Although SKI-Pro is designed for accurate, fast processing with a minimum of operator interaction, it still provides the advanced user with ample scope for individual control and analysis.

Code and attribute lists, map projections, ellipsoids, geoidal models, transformation sets etc. can be generated and stored in SKI-Pro and transferred to and from the receiver.

Components

- Configuration
- Planning
- Project management
- Data import
- Data processing
- Least-squares adjustment
- Viewing and editing
- Datums, geoidal models
- Projections, ellipsoids
- Country-specific coordinate systems
- Transformations
- Reporting
- Code/attribute lists
- Coordinate upload
- RINEX
- Export to other systems

Baseline rms with SR530 and SKI-Pro

Static: 3mm + 0.5ppm For geodetic networks

0.5ppm can be achieved on long lines with long observation times. Millimeter-level accuracies are possible on short lines if choke-ring antennas are used.

Rapid Static: 5mm + 0.5ppm For local control

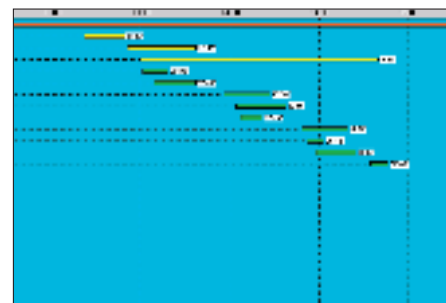
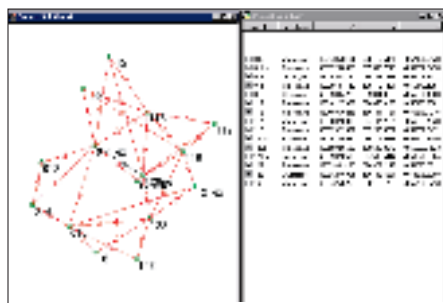
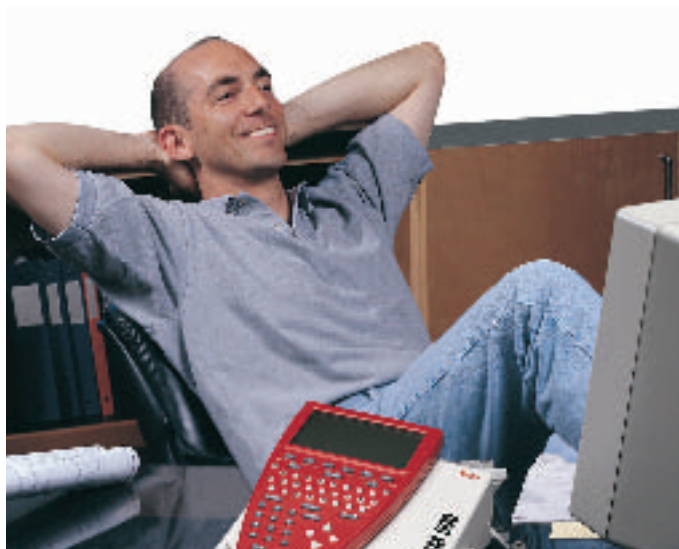
Observations of a few minutes only provide centimeter-level accuracies on lines up to about 15 to 20km. Quick and efficient, the best method for control surveys, densification, traverse, photo control, boundary surveys etc.

Kinematic, On the Fly 10mm + 1ppm For detail and topo

All types of stop & go, kinematic and on-the-fly data can be post-processed with SKI-Pro. You can infill gaps in real-time surveys and combine real-time and post-processed results.

Differential code: 25cm For GIS and seismic

With high-accuracy pseudorange measurements, the SR530 can carry out differential-code surveys in real time or with post processing to up to 25cm accuracy.



Technical specifications: SR530 dual-frequency, geodetic, real-time-kinematic receiver



Modes and applications	Static, Rapid Static, Kinematic, On The Fly Real Time RTK, DGPS/RTCM, Post Processing
12 L1 channels	Full phase, C/A narrow code, precision code
12 L2 channels	Full phase, P code, P-code-aided under AS
Power and weight	Nominal 12VDC. 7W for SR530 + terminal. Wt. 1.25kg
AT502 antenna	L1/L2 microstrip, built-in groundplane, 0.4kg
Baseline rms with RTK	Stationary, after initialization: 5mm + 0.5ppm (rms) Moving, after initialization: 10mm + 1ppm (rms)
Baseline rms with post processing using SKI-Pro software	Static, long lines, long observations: 3mm + 0.5ppm (rms) Rapid static: 5mm + 0.5ppm (rms) Kinematic/moving after initialization: 10mm + 1ppm (rms)
Baseline rms DGPS/code	DGPS/RTCM and code only: typically 25cm (rms)
Note on baseline rms	Baseline rms = accuracy in position Accuracy in height = 2 x accuracy in position
Figures are for normal to favorable conditions	Figures also depend on number of satellites, geometry, observation time, ephemeris, ionosphere, multipath etc.
On The Fly RTK initialization	Time: typically 10 secs. Reliability better than 99.99%. Range: typically 10km with low-power radio. Up to 30km with high-power radio or GSMphone in favorable conditions
TR500 terminal	Display: 12 lines of 32 characters. Weight 0.4kg
Data recording, selectable 0.1 to 60 secs. rec. rate	PCMCIA ATA flash cards: 8MB, 16MB, 96MB Optional internal memory: 8MB, 16MB
16MB capacity (Divide/2 for 8MB; Multiply x 6 for 96MB)	About 625 hours at 15 sec rate, 2500 hours at 60 sec About 16 000 real time positions
GEB121 battery, 2 batteries plug into SR530	3.6Ah/6V. 2 GEB121 power SR530 + terminal for about 6 hours. GEB121: weight, 0.35kg
External power supply	GEB71 7Ah/12V external battery or any 12V source
Operation without terminal	Automatic on switching ON, 3 LED status displays
Operation with terminal	Menu driven, two-level operating system
Operating modes	Survey, stakeout, navigation, RTK, RTCM, timer
Coordinate displays	Geog: Lat, Long, Ht Cartesian: X, Y, Z Grid: E, N, Ht
Stakeout display	Graphical with zoom. Digital. Polar and orthometric.
Stakeout accuracy	10mm + 1ppm at 10Hz (0.1sec) update rate
Position update rate	10Hz (0.1 sec). Latency <0.03sec.
Standard programs	Coordinate geometry. Areas. Lines/grids/slopes. Hidden point.
Optional programs	RoadPlus, Quick Slope, DTM Stakeout
Coordinate systems	Ellipsoids, projections, transformations, geoidal models
Environmental:	Operation Storage
Receiver, terminal etc	-20 deg. C to +55 deg. C -40 deg. C to +70 deg. C
Antenna	-40 deg. C to +75 deg. C -40 deg. C to +75 deg. C
SKI-Pro software	Professional Office Support Software
Not protected, run without software-protection key	Planning, management, transfer, ASCII import/export, view/edit, coding, reporting, help
Protected options, need software-protection key	Data processing, datum/map/transformation, design/adjustment, GIS/CAD export, RINEX import



Total Quality Management
is our commitment to total
customer satisfaction.

For more information about
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