System 500

- **LEICA SR530**
  Dual-frequency, geodetic, RTK receiver

- **LEICA SR520**
  Dual-frequency, geodetic receiver

- **LEICA SR510**
  Single-frequency, survey receiver

- **SKI-Pro**
  Professional office software

	SR530	*SR520*	*SR510*
Introduction			
Receiver type	Dual-frequency, geodetic, real-time RTK receiver	Dual-frequency, geodetic receiver	Single-frequency, survey receiver
Summary of measuring modes and applications	Static, rapid static, kinematic On the fly L1 + L2, code, phase Real-time RTK standard Post processing DGPS/RTCM standard Survey, geodetic and real-time RTK applications	Static, rapid static, kinematic On the fly L1 + L2, code, phase Post processing DGPS/RTCM optional Survey and geodetic applications	Static, kinematic L1, code, phase, Post processing DGPS/RTCM optional Survey and GIS applications

Technical Specifications

Leica
Geosystems

	SR530	*SR520*	*SR510*
Receiver specifications			
Receiver technology	ClearTrak - patented. Multibit, SAW filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even to low satellites and in adverse conditions. Interference resistant. Multipath mitigation.		
No. of channels	12 L1 + 12 L2	12 L1 + 12 L2	12 L1
L1 measurements	Carrier phase full wave length C/A narrow code Precision code	Carrier phase full wave length C/A narrow code Precision code	Carrier phase full wave length C/A narrow code Precision code
L2 measurements	Carrier phase full wave length with AS off or on P2 code / P-code aided under AS Equal performance with AS off or on	Carrier phase full wave length with AS off or on P2 code / P-code aided under AS Equal performance with AS off or on	No
Independent measurements	Fully independent L1 and L2 code and phase measurements	Fully independent L1 and L2 code and phase measurements	Fully independent L1 code and phase measurements
Time to first phase measurement after switching ON	Typically 30 secs	Typically 30 secs	Typically 30 secs
LED status indicators	3: for power, tracking, recording	3: for power, tracking, recording	3: for power, tracking, recording
Ports	3 RS232/power ports 1 RS232 only port 1 Power only port 1 TNC port for antenna 1 PPS, 2 Event port optional	2 RS232/power ports 1 RS232 only port 1 Power only port 1 TNC port for antenna	2 RS232/power ports 1 RS232 only port 1 Power only port 1 TNC port for antenna
Supply voltage Power consumption	Nominal 12V DC 7W, receiver with terminal	Nominal 12V DC 5.5W, receiver with terminal	Nominal 12V DC 5.3W, receiver with terminal
Dimensions: L x B x Ht Weight, receiver only	205mm x 165mm x 72mm 1.25kg	205mm x 165mm x 72mm 1.15kg	205mm x 165mm x 72mm 1.15kg
Antennas			
Standard survey antenna Dimensions:diameter x ht Weight	AT502, L1/L2 microstrip Built-in groundplane 160mm x 50mm 0.4kg	AT502, L1/L2 microstrip Built-in groundplane 160mm x 50mm 0.4kg	AT501, L1 microstrip Built-in groundplane 160mm x 50mm 0.35kg
Standard choke-ring antenna Dimensions:diameter x ht Weight	AT503 choke-ring, L1/L2 microstrip. Optional radome 300mm x 75mm (antenna) 2.45kg (antenna)	AT503 choke-ring, L1/L2 microstrip. Optional radome 300mm x 75mm (antenna) 2.45kg (antenna)	L1 choke-ring, microstrip. With radome 365mm x 80mm (antenna) 4.0kg (antenna)
Special choke-ring antenna Dimensions:diameter x ht Weight	AT504 choke-ring, L1/L2 microstrip. Dorne Margolin, JPL design. Optional radome 380mm x 130mm (antenna) 4.3kg (antenna)	AT504 choke-ring, L1/L2 microstrip. Dorne Margolin, JPL design. Optional radome 380mm x 130mm (antenna) 4.3kg (antenna)	No
Measurement precision with AS off or on			
Carrier phase on L1 Carrier phase on L2 Code (pseudorange) on L1 Code (pseudorange) on L2	0.2mm rms 0.2mm rms 5cm rms 5cm rms	0.2mm rms 0.2mm rms 5cm rms 5cm rms	0.2mm rms 5cm rms
Accuracy, baseline rms	Accuracy in position = baseline rms. Accuracy in height = 2 x accuracy in position		
Baseline rms with post processing	With SKI-Pro L1/L2 software	With SKI-Pro L1/L2 software	With SKI-Pro L1 software
Static (phase), long lines, long observations, choke-ring antenna	3mm + 0.5ppm	3mm + 0.5ppm	Not applicable
Static and rapid static (phase) with standard antenna)	5mm + 0.5ppm (rms)	5mm + 0.5ppm (rms)	10mm + 2ppm (rms)
Kinematic (phase), in moving mode after initialization	10mm + 1ppm (rms)	10mm + 1ppm (rms)	20mm + 2ppm (rms)
Code only	Typically 25cm (rms)	Typically 25cm (rms)	Typically 30cm (rms)

	SR530	*SR520*	*SR510*
Baseline rms with real-time /RTK	Real-time/RTK standard	No	No
Rapid static (phase), static mode after initialization	5mm + 0.5ppm (rms)		
Kinematic (phase), moving mode after initialization	10mm + 1ppm (rms)		
Code only	Typically 25cm (rms)		
Baseline rms with DGPS/RTCM	DGPS/RTCM standard	DGPS/RTCM optional	DGPS/RTCM optional
DGPS/RTCM	Typically 25cm (rms)	Typically 25cm (rms)	Typically 30cm (rms)
On-the-fly initialization	Real time and post processing	Post processing only	No
Reliability of OTF initialization	Better than 99.99%	Better than 99.99%	
Time for OTF (on-the fly) initialization	Real time: Typically 10secs with 5 or more satellites on L1 and L2 Post processing: Typically 40 seconds with 5 or more satellites on L1 and L2	Post processing: Typically 40 seconds with 5 or more satellites on L1 and L2	
Range for OTF (on-the fly) initialization	Typically up to 20km in normal conditions with standard radio. Up to 30km in favourable conditions with powerful radio.	Typically up to 20km in normal conditions. Up to 30km in favourable conditions.	
Note on accuracies and times	Baseline rms, accuracy in position and accuracy in height are dependent upon various factors including number of satellites, geometry, observation time, ephemeris accuracy, ionospheric conditions, multipath etc. Figures quoted assume normal to favourable conditions. Times can also not be quoted exactly. Times required are dependent upon various factors including number of satellites, geometry, ionospheric conditions, multipath etc		
Navigation position	5–10m rms for each coordinate Degradation possible due to SA	5–10m rms for each coordinate Degradation possible due to SA	5–10m rms for each coordinate Degredation possible due to SA
Position update and latency	RTK and DGPS standard	DGPS optional	DGPS optional
Position update rate	Selectable: 0.1 sec (10Hz) to 60 secs	Selectable: 0.1 sec (10Hz) to 60 secs	Selectable: 0.1 sec (10Hz) to 60 secs
Position latency	0.03 sec or less	0.07 sec or less	0.07 sec or less
Real-time RTK and DGPS/RTCM	Real-time RTK standard DGPS/RTCM standard	DGPS/RTCM optional	DGPS/RTCM optional
RTK and RTCM formats for transmission and reception	Leica proprietary format. CMR, RTCM V2.1 and V2.2 formats, messages 1,2,3,9,18, 19,20,21,22. (Message 9, input only).	RTCM V2.1 and V2.2 formats messages 1,2,3,9 (Message 9, input only)	RTCM V2.1 and V2.2 formats messages 1,2,3,9 (Message 9, input only)
Number of radio modems	Real-time RTK standard DGPS/RTCM standard	DGPS/RTCM optional	DGPS/RTCM optional
No. of radio modems that can be connected	2 for RTK/RTCM transmission, 1 for reception 1 for NMEA transmission	2 for RTCM transmission, 1 for reception	2 for RTCM transmission, 1 for reception

	SR530, SR520, SR510
TR500 Terminal	For SR530, SR520, SR510
Display type and size	LCD, 12 lines, 32 characters per line
Display, illumination/contrast	Illumination, variable contrast
Keyboard	Full alphanumeric, function keys, user-definable keys
Weight of terminal	0.4kg
Data recording	For SR530, SR520, SR510
Recording rate	Selectable from 0.1 to 60 secs.
Standard medium	PCMCIA ATA Flash RAM cards: 8MB, 16MB, 96MB
Optional medium	Internal memory for receiver: 8MB, 16MB
Recording capacity with SR510:	SR510 with 5 sats on L1
8MB card with SR510	About 480 hours at 15 sec rec rate. 1920 hours at 60 sec.
16MB card with SR510	About 960 hours at 15 sec rec rate. 3840 hours at 60 sec.
Recording capacity with SR520/SR530:	SR520/SR530 with 5 sats on L1 and L2
8MB card with SR520/SR530	About 310 hours at 15 sec rec rate. 1240 hours at 60 sec.
16MB card with SR520/SR530	About 620 hours at 15 sec rec rate. 2480 hours at 60 sec.
96 MB card with SR520/SR530	About 248 hours at 1 sec rec rate. 3720 hours at 15 sec.
Recording capacity with SR530:	SR530 RTK positions with point ids., codes, attributes etc.
8MB card with SR530	About 8000 positions
16MB card with SR530	About 16000 positions
96 MB card with SR530	About 96000 positions
Power supply	For SR530, SR520, SR510
Plug-in battery, standard	GEB121 rechargeable Camcorder battery 3.6Ah/6V
2 batteries plug into receiver	2 GEB121 power SR530 and terminal for about 6 hours
Power receiver only for	2 GEB121 power SR520/SR510 and terminal for about 7.5 hours
Weight, GEB121 plug-in battery	0.35kg
External battery, optional	GEB71 7Ah/12V NiCd battery
Powers receiver only for	1 GEB71 powers SR530 and terminal for about 12 hours
	1 GEB71 powers SR520/SR510 and terminal for about 15 hours
Weight, GEB71 external battery	3.0kg
Operation	Identical for SR530, SR520, SR510
Manual operation with TR500 terminal	Standard method. Receiver control, operation, data input, survey-data acquisition, information display via terminal
Automatic operation without terminal	Automatic on switching on. Modes and parameters for receiver operation, measuring, recording, transmission etc preset using terminal. 3 LED's indicate power, tracking, recording
Man-machine interface	Identical for SR530, SR520, SR510 with TR500 Terminal
Receiver/tracking functions Displays, information, status, settings for:	Satellite status, tracking, health Cut-off angle Azimuth, elevation, signal strength Sky plot GDOP/PDOP/HDOP/VDOP Time: GPS, local, zone Receiver status
Receiver operation Displays, information, status, settings for:	Receiver configuration Position update rate Recording rate Free recording capacity Manual or automatic operation Battery status Multiple timer/wake-up sessions
Surveying functions Displays, information, status, settings for:	Measuring mode selection Stop & Go indicator Point identifiers Antenna heights and offsets

Coding systems
  1. OSW (Open Survey World)
  2. GSI-8
  3. GSI-16
  4. Free format
  5. Notes
	Five types of coding systems
	Layer, code, attribute (user definable)
	8-character blocks, compatible with Leica TPS
	16-character blocks, compatible with Leica TPS
	Free-format, user-definable blocks
	Point annotations (notes)

	SR530, SR520, SR510
Coordinate (position), baseline, stakeout displays	Identical for SR530, SR520, SR510
All displays apply to:	Real-time RTK, DGPS, and navigation positions
Real-time RTK	SR530 standard
DGPS	SR530 standard, SR520/SR510 optional
Navigation	SR530, SR520, SR510
Coordinate (position) displays:	
Ellipsoidal	Latitude, longitude, height.
Cartesian	X, Y, Z
Grid	Easting, Northing, Height
Height	Ellipsoidal, Orthometric
Baseline display	Slope distance, height difference
Stakeout mode for	Points, lines, grids
Stakeout displays	Graphical with automatic zoom
	Digital: polar, orthometric
Stakeout, orientation selection	True north, grid north, point, last point, line, sun, arrow
Stakeout accuracy with RTK	10mm + 1ppm at 10Hz (0.1sec) display-update rate
Data-base	Identical for SR530, SR520, SR510
File organization	User-definable projects
Point organization	Point identifiers, coordinates, codes, attributes etc.
Functions	Search, filter, and display routines
	Multiple-point averaging
Coordinate systems	Management of ellipsoids, projections, geoidal models, transformation parameters
Ellipsoids	All common ellipsoids
	User-definable ellipsoids
Map projections	Transverse Mercator
User definable	UTM
and country specific	Oblique Mercator
	Lambert (1 and 2 standard parallels)
	Soldner Cassini
	Polar Stereographic
	Other country-specific projections
Geoidal model	Upload geoidal model from SKI-Pro
Transformation in receiver	Classical 7-parameter 3-D Helmert
	One step and two step (direct WGS84 to grid)
Navigation	Full navigation information in position and stakeout displays
	Position, course, speed, bearing and distance to waypoint
NMEA output	For real-time/RTK, DGPS, navigation positions
NMEA sentences	NMEA 0183 V2.20 and Leica proprietary
Standard application software	Identical for SR530, SR520, SR510
Applies to:	Real-time/RTK, DGPS, navigation
Real-time RTK	SR530 standard
DGPS	SR530 standard, SR520/SR510 optional
Navigation	SR530, SR520, SR510
Areas	Area calculation
COGO functions	Inverse, traverse, intersections, offsets, 3-point arc etc.
Hidden point	Hidden point computation
Optional application software	For SR530 only
Optional programs for	RoadPlus
real-time/RTK stake out	Quick slope
	DTM Stake out
OWI interface	Leica proprietary Outside World Interface
For receiver control	Binary or ASCII
	Receiver control from PC etc.

	SR530, SR520, SR510
Data links	Radio modems and GSM phones
Data links for	Real-time RTK and DGPS
Real-time RTK	SR530 standard
DGPS	SR530 standard. SR520/SR510 optional
Radio modems	Any suitable radio modem with RS232 interface and operating in transparent mode (without handshake)
Recommended radio modems	Satelline 2ASxE, Pacific Crest RFM96W
GSM phones	Any suitable model
Recommended GSM phone	Siemens GSM Module M20 phone

	Environmental specifications	For SR530, SR520, SR510	
		Operation	Storage
Receiver		-20°C to +55°C	-40°C to +70°C
Terminal		-20°C to +55°C	-40°C to +70°C
Antenna		-40°C to +75°C	-40°C to +75°C
PCMCIA Flash RAM cards		-20°C to +75°C	-40°C to +75°C
Optional internal memory		-20°C to +55°C	-40°C to +70°C
Humidity		up to 95%; not condensing	
Weather		Withstand rain, snow, dust, sand, cold, heat	
Transport		Withstand rough field transport, shocks, jolts, vibrations etc when packed in instrument container	
Usage		Built for field use	

SKI-Pro	*Professional office software for post processing and real time*
General description	Comprehensive, automated suite of programs for GPS surveying, including post processing and support of real-time measurements. Covers planning, data and project management, data transfer, import/export, processing, viewing, editing, adjustment, coordinate systems, transformations, coding systems, reporting etc. Runs on 32-bit Windows™ 95, 98, 2000 and NT platforms.
Man-machine interface	Intuitive graphical interface with standard Windows™ operating procedures. Users can customize desktop, toolbars, interface etc according to their preferences
Components	
Non-protected components Run without software protection key	Planning, data and project management, data transfer, ASCII import/export, view and edit, coding systems, reporting, help
Protected options Software-protection key needed	L1 data processing option L1 and L2 data processing option Datum and Map transformation option Design and Adjustment option GIS/CAD export option RINEX import option
Non-protected components	
Planning Not protected	Satellite visibility, PDOP/GDOP Azimuth and elevation Obstructions, Sky plot etc
Data and Project Management Not protected	Fast, powerful data base Work organised in projects Coordinate-system management for ellipsoids, projections, transformation parameters All common ellipsoids and projections, plus user definable ellipsoids and projections Accesses geoidal-model programs for application of N values Antenna management system for offsets and eccentricities Code-management system for layer/code/attribute lists
Data transfer and ASCII import/export Not protected	Transfer (import) of raw-measurement data Transfer (import) of real-time (RTK) and DGPS coordinates Import and export of coordinates, code lists, map projections, ellipsoids, transformation parameters etc Export of coordinates, baseline data etc possible from several components Export formats: Standard ASCII formats, User-definable ASCII formats
View and edit Not protected	Graphical display of points, baselines, kinematic chains etc. Full editing of point, coordinate, baseline, antenna, code/attribute data etc. Coordinate conversion geograhical > cartesian > grid and vice-versa Accesses geoidal-model programs for N values
Code-list generation Not protected	Generation of code lists with layers, codes, attributes Management of code lists
Reporting and log files Not protected	Configure, display, print, save, and export of results from all components Reporting and log files from all components
Protected options	
Data processing L1 data processing option L1 and L2 data processing option Protected options	Graphical interface for baseline selection, processing commands etc Automatic or manual selection of baselines Automatic or manual definition of processing sequence Single baseline or multi-baseline batch processing Wide range of processing parameters Automatic screening, cycle-slip fixing, outlier detection etc Automated processing or user-controlled processing
Data-processing modes	Static, rapid static, kinematic, single point On-the-fly with L1 + L2 processing
Types of data	Phase only, code and phase, code only
Datum and Map Protected option Accesses coordinate-management system with ellipsoids, projections, transformation parameters. Coordinate conversion Geograhical > Cartesian > Grid and vice-versa. Accesses geoidal-model programs for application of N values.	5 methods for computing transformation parameters: • Classical 3-D: 7-parameter Helmert between 2 Cartesian systems • Stepwise: 2D transformation for position and modelled local height datum • Interpolate: Direct from WGS84 to grid (affine) with modelled local height datum • One step/two step: Direct WGS84 to grid with interpolated local height datum • Classical 2-D: 4-parameter Helmert between 2 grid systems Distribution of residuals Outlier detection, statistical analysis, log file, reporting

SKI-Pro	Professional office software for post processing and real time
Protected options (continued)	
Design and Adjustment option Protected option	Network design and analysis prior to observing Least-squares adjustment of networks of GPS baselines Terrestrial observations can be included (manual input) Free, constrained, and partially constrained adjustments Outlier detection, statistical analysis, log file, reporting
GIS/CAD export option Protected option	AutoCAD DXF/DWG Permits export to GIS/CAD systems such as AutoCAD, MicroStation
RINEX import Protected option	Import of data in RINEX format For processing of data from non-Leica receivers
PC configuration	For SKI-Pro software
Minimum PC configuration Minimum configuration for running SKI-Pro software Enhanced configuration is advisable for fast and efficient handling and processing of large amounts of data	IBM or Compaq compatible Intel Pentium processor, 90MHz 32MB RAM 100MB free space on harddisk RS232 port Parallel port CD-ROM drive VGA colour monitor Mouse installed Windows 95
Recommended PC configuration For fast and efficient use of SKI-Pro software, especially for handling and processing large amounts of data, the configuration of the PC should have at least this level. Enhanced configuration is preferable.	IBM or Compaq compatible Intel Pentium processor, 200MHz or more 64MB RAM or more 300MB or more free space on harddisk 1 or more RS232 ports Parallel port CD-ROM drive PCMCIA slot VGA colour monitor Mouse installed Windows 98, 2000 or NT

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