

POB 2004 GPS Equipment Survey – Geodetic Receivers

MANUFACTURER/DISTRIBUTOR	Allen Osborne Assoc. Inc.	Leica Geosystems	Leica Geosystems	Leica Geosystems	Leica Geosystems	Leica Geosystems	Leica Geosystems	Leica Geosystems
RECEIVER MODEL	Rascal-B	GX1210	GX1220	GX1230	RS500 Advanced CORS	SRS10	SRS20	SRS30
Manufacturer's phone number	805/495-8420	800/367-9453	800/367-9453	800/367-9453	800/367-9453	800/367-9453	800/367-9453	800/367-9453
Receiver tracking characteristics								
Single-frequency or dual-frequency GPS?	Dual	Single	Dual	Dual	Dual	Single	Dual	Dual
L1 C/A code, L1 carrier	L1 only, codeless	L1 only, C/A-code	L1 codeless and L2 codeless	L1 C/A-code and L2 codeless	L1 C/A-code and P-code, L2 P-code	L1 C/A-code and L2 P-code	Other	
GLONASS?	No	No	No	No	No	No	[20]	[20]
WAAS?	No	Yes	Yes	Yes	No	No	No	No
Max. number of satellites tracked simultaneously	8	12	12	12	12	12	12	12
Number of receiver channels	32	12	24	24	24	24	24	24
Selectable data interval for phase measurement?	1-3600	0.05 to 300 seconds	0.05 to 300 seconds	0.05 to 300 seconds	0.1 to 60 seconds	0.1 to 60 seconds	0.1 to 60 seconds	0.1 to 60 seconds
When four satellites are tracked, does the receiver display provide:								
Satellite tracking status?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coordinated Universal Time (UTC)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Three-dimensional positions?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Velocity?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dilution of precision?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Real-time map display with linework and background	No	Yes	Yes	Yes	No	No	N/A	No
Touch screen display?	No	Yes	Yes	Yes	No	No	No	No
Coordinates in grid, local or ground values? If yes, state which.	Geod/Grid/Local/Ground	Grid/Ground/Ellipsoid	Grid/Ground/Ellipsoid	Grid/Ground/Ellipsoid	Yes, Geodetic/Grid/Local	Yes, Geodetic/Grid/Local	Yes, Geodetic/Grid/Local	Yes, Geodetic/Grid/Local
Horizontal Accuracy (Std. Dev.)								
Static (cm)	0.4 cm + 0.5 ppm	1.0cm + 1ppm	0.5cm + 0.5ppm	0.5cm + 0.5ppm	[16]	1.0 cm + 2 ppm [21]	0.5 cm + 0.5 ppm [29]	0.5 cm + 0.5 ppm [30]
RTK (cm)	1 cm + 1 ppm	N/A	N/A	1.0cm + 1ppm	N/A	N/A	N/A	1.0 cm + 1 ppm
Does the receiver accurately measure and output:								
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	No	N/A	Yes	Yes	Yes	N/A	Yes	Yes
Cross-correlated Y2 - Y1 pseudoranges?	Yes [2]	N/A			[17]	N/A		
Other dual-frequency technology					See Advanced Features	N/A	See Advanced Features	See Advanced Features
Specify available observables (e.g. L1 C/A, L1 Phase, etc.)		L1 Phase, L1 C/A	[11]	[11]	[18]	[22]	[30]	[30]
On what medium is observed data recorded during the observations?						[23]	PCMCIA or internal	[23]
Internal memory?	Yes	Yes	Yes	Yes	Internal or removable	Optional	Optional	Optional
Other medium?		Compact Flash Card	Compact Flash Card	Compact Flash Card		PCMCIA Card	Removable PCMCIA Card	PCMCIA Card
If recorded in the internal memory, what medium is available to transfer to after the observations end? (serial port, IR port, USB port, removable media memory, other)	RS-232	[7]	[7]	[7]	PCMCIA Serial/PCMCIA	[24]	[24]	[24]
Maximum internal memory capacity (Mb)	16	256 MB internal (optional)	256 MB internal (optional)	256 MB internal (optional)	440 Mb	[25]	[25]	[25]
Maximum data transfer speed from internal memory to PC (baud)	38,400	115,200	115,200	115,200	115,200	115,200	115,200	115,200
RECEIVER INTERFACE								
Are the following supported on the single component of the system, which includes the Receiver (Rx), or the controller or handheld computer (C) or both (B).								
Alpha-numeric entry of data	B	C	C	C	Yes	C	C	C
Text warnings	B	C	C	C	Yes	C	C	C
Setting of receiver parameters	B	C	C	C	Yes	C	C	C
Receiver status	B	B	B	B	Yes	B	B	B
Messages formed with LEDs	B	Rx	Rx	Rx	Yes	Rx	Rx	Rx
Messages formed with LCDs	[3]	C	C	C	Yes	C	C	C
Can receiver be used in a vehicle for positioning and navigation?		Yes	Yes	Yes	No	Yes	Yes	Yes
Can the receiver perform:								
Kinematic surveys?	Yes	Yes	Yes	Yes	Broadcast reference station only	Yes	Yes	Yes
Pseudo-kinematic surveys?	Yes	Yes	Yes	Yes	Broadcast reference station only	Yes	Yes	Yes
Rapid static surveys?	Yes	Yes	Yes	Yes	Broadcast reference station only	Yes	Yes	Yes
Can the receiver perform real-time kinematic surveys?	Yes	No	No	Yes	Broadcast reference station only	No	No	Yes
If yes, does it have on-the-fly ambiguity resolution capabilities?	Yes	NA	NA	Yes		NA	NA	Yes
Is RTK radio internal or external?	External	NA	NA	External integrated without cables		NA	NA	External (no cable required)
Use of multiple RTK base stations on a single radio	No	NA	NA	Yes		NA	NA	Yes
Can the receiver perform real-time Differential GPS (DGPS)?	No	Yes (optional)	Yes (optional)	Yes	Broadcast reference station only	Yes	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	No	Yes (optional)	Yes (optional)	Yes	Broadcast reference station only	Yes	Yes	Yes
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	No	Yes (optional)	Yes (optional)	Yes	Broadcast reference station only	Yes	Yes	Yes
Time to first satellite signal lock (seconds)	30 seconds	[8]	[8]	[12]	30 seconds	30 seconds	30 seconds	30 seconds
For all available satellites? (seconds)	< 90 seconds	[8]	[8]	[12]	30 seconds	30 seconds	30 seconds	30 seconds
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If "Yes," can the system be programmed with information for multiple sessions?		Yes	Yes	Yes	Yes	Yes	Yes	Yes
If the system can be preprogrammed, can alphanumeric data be input?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Does the receiver give some indication that data is being recorded?	Yes, selectable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size: (H" x W" x D")	8.6 x 4.1 x 1.9	3.1 x 6.5 x 8.3	3.1 x 6.5 x 8.3	3.1 x 6.5 x 8.3	2.8 x 6.5 x 8.1	2.8 x 6.5 x 8.1	2.8 x 6.5 x 8.1	2.8 x 6.5 x 8.1
Weight: (lbs. Receiver only)	2.2	2.6	2.6	2.6	8.2	2.5	2.5	2.7
Is antenna included in the weight?	No	No	No	No	No	No	No	No
Weight (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)	8.5	NA	NA	7.9	N/A	N/A	N/A	8.2
Receiver housing material (e.g. plastic, metal)	Magnesium alloy	Magnesium housing	Magnesium alloy	Magnesium alloy	Plastic composite	Plastic composite	Plastic composite	Plastic composite
Humidity proofing (e.g. 95%, 100% non-condensing)	100%	100% non-condensing	100% non-condensing	100% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing
Drop height survival (m/ft)	5 ft	1.5 m	1.5 m	1.5 m	1.2 m	1.2	1.2 m	1.2 m
Waterproofing (e.g. IPX5, IPX6, IPX7)	[4]	IP67	IP67	IP67	IPX5	IPX5	IPX5	IPX5
Operating Temperature Range (degrees F/C)	-20 to 55° C	-40 to 40° C	-40 to 40° C	-40 to 40° C	-20 to 55° C	-20 to 55° C	-20 to 55° C	-20 to 55° C
Is standard battery internal?	No	Yes	Yes	Yes	Camcorder	[26]	[26]	[26]
Hours of operation at 0 degrees C with standard battery	8	5 (single battery)	5 (single battery)	5 (single battery)	[26]	[26]	[26]	[26]
Input voltage range (v)	6 vdc	10.5 to 28	10.5 to 28	10.5 to 28	10 to 16	10 to 16	10 to 16	10 to 16
Power consumption? (watts, receiver only)	< 5	3.8	3.8	3.8	5	5.3 (with terminal)	5.3 (with terminal)	7 (with terminal)
Power consumption? (watts complete RTK rover inc. receiver, antenna, radio, controller)	< 5.5	N/A	N/A	[13]	Varies, 5 to 7 watts	N/A	N/A	Varies depending on radio consumption
Has the system (including all components) been tested by the (FGCS)*?	No	No	No	No	Yes	Yes	Yes	Yes
ANTENNA								
Type:	Helical	AX1201	AX1202	AX1202	IGS/JPL Chokingering	AT501 Single Frequency	AT502 Dual Frequency	AT502 Dual Frequency
Is antenna built into the receiver?	No	No	No	No	No	No	No	No
If "Yes," is antenna removable?								
If it is not removable, is there a provision for an external antenna?								
Weight, antenna (lbs.)	1.5	0.97	0.97	0.97	10.2	0.77	0.88	0.88
Length of antenna cable furnished with receiver?	8 ft	2.8 m typical	2.8 m typical	2.8 m typical	123 ft	[27]	[108]	[108]
Maximum length of antenna cable that can be used?	[5]	[9]	[9]	[9]	[14]	60 m [28]	60 m [28]	60 m
Is a system available for postprocessing data?	Yes, TurboSurvey Software 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes
U.S. SUGGESTED LIST PRICE (\$)	\$6550	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems
Receiver?		Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems
Antenna?		Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems
Postprocessing hardware and software?	[6]	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Leica SKI-Pro/SPIDER	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems
WARRANTY (months)	12	12	12	12	12	12	12	12
Receiver?	12	12	12	12	12	12	12	12
Antenna?	12	12	12	12	12	12	12	12
Postprocessing hardware?	12	12 with support contract	12 with support contract	12 with support contract	12	12	12	Leica SKI Pro
ADVANCED FEATURES	[2]	[10]	[10]	[15]	[19]	[31]	[31]	[31]
READER SERVICE NUMBER	1	2	3	4	5	6	7	8

*Federal Geodetic Control Subcommittee
Numbers in brackets refer to notes on page 49.

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MANUFACTURER/DISTRIBUTOR	NavCom Technology Inc.	NavCom Technology Inc.	NavCom Technology Inc.	NavCom Technology Inc.	NavCom Technology Inc.	NavCom Technology Inc.	SOKKIA	SOKKIA
RECEIVER MODEL	NCT-2030M	RT-3010S	RT-3020S/M	SF-2040G	SF-2050G/M/R	VueStar	GSR2600	GSR2650 LB
Manufacturer's phone number	310/381-2000	310/381-2000	310/381-2000	310/381-2000	310/381-2000	310/381-2000	800/255-3913	800/255-3913
Receiver tracking characteristics								
Single-frequency or dual-frequency GPS?	Dual	Dual	Dual	Dual	Dual	Dual	Dual	Dual
L1 C/A code, L1 carrier								
L1 only, codeless								
L1 only, C/A-code								
L1 codeless and L2 codeless								
L1 C/A-code and L2 codeless								
L1 C/A-code and P-code, L2 P-code	Yes	Yes	Yes	Yes	Yes	Yes		
L1 C/A-code and L2 P-code								
Other							[41]	[41][42]
GLONASS?	No	No	No	No	No	No	No	No
WAAS?	Yes	Yes	Yes	Yes	Yes	Yes	Optional	Optional
Max. number of satellites tracked simultaneously	10 GPS + 2 SBAS	10 GPS + 2 SBAS	10 GPS + 2 SBAS	10 GPS + 2 SBAS	10 GPS + 2 SBAS	10 GPS + 2 SBAS	12	12 + Omnistar
Number of receiver channels	20 GPS + 2 SBAS	20 GPS + 2 SBAS	20 GPS + 2 SBAS	20 GPS + 2 SBAS	20 GPS + 2 SBAS	20 GPS + 2 SBAS	24	25
Selectable data interval for phase measurement?	0.02 to 800 seconds	0.02 to 800 seconds	0.02 to 800 seconds	0.02 to 800 seconds	0.02 to 800 seconds	0.02 to 800 seconds	0.05 to 60 seconds	0.05 to 60 seconds
When four satellites are tracked, does the receiver display provide:								
Satellite tracking status?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coordinated Universal Time (UTC)?	Yes [32]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes	Via optional data collector
Three-dimensional positions?	Yes [32]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes	Via optional data collector
Velocity?	Yes [32]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes	Via optional data collector
Dilution of precision?	Yes [32]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes	Via optional data collector
Real-time map display with linework and background	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Via optional data collector	Via optional data collector
Touch screen display?	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Via optional data collector	Via optional data collector
Coordinates in grid, local or ground values? If yes, state which.	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Yes [33]	Via optional data collector	Via optional data collector
Horizontal Accuracy (Std. Dev.)								
Static (cm)	0.5 + 1ppm	0.5 + 1 ppm	0.5 + 1 ppm	0.5 + 1 ppm	0.5 + 1 ppm	0.5 + 1 ppm	0.5 cm + 1 ppm	0.5 cm + 1 ppm
RTK (cm)	1.0 + 1ppm	1.0 + 1ppm	1.0 + 1 ppm	1.0 + 1 ppm	1.0 + 1 ppm	1.0 + 1 ppm	1 cm + 1 ppm	1 cm + 1 ppm
Does the receiver accurately measure and output:								
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cross-correlated Y2 - Y1 pseudoranges?	No	No	No	No	No	No	No	No
Other dual-frequency technology	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specify available observables (e.g. L1 C/A, L1 Phase, etc.)	[34]	[34]	[34]	[34]	[38]	[38]	L1/L2 code and carrier	L1/L2 code and carrier
On what medium is observed data recorded during the observations?								
Internal memory?	Yes	Yes	Yes	Yes	Yes	Yes	CompactFlash card	No
Other medium?	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA
If recorded in the internal memory, what medium is available to transfer to after the observations end? (Serial port, IR port, USB port, removable media memory, other)	Serial	Serial	Serial	Serial	Serial	Serial	Eject card or serial transfer	
Maximum internal memory capacity (Mb)	64	64	64	64	64	64	Varies with CF card	
Maximum data transfer speed from internal memory to PC (baud)	115K	115K	115K	115K	115K	115K	115K baud	
RECEIVER INTERFACE								
Are the following supported on the single component of the system, which includes the Receiver (Rx), or the controller or handheld computer (C) or both (B).								
Alpha-numeric entry of data	C	C	C	C	C	C	B	C
Text warnings	C	C	C	C	C	C	B	C
Setting of receiver parameters	C	C	C	C	C	C	B	C
Receiver status	B	B	B	B	B	B	B	B
Messages formed with LEDs							Rx	Rx
Messages formed with LCDs	C	C	C	C	C	C	B	C
Can receiver be used in a vehicle for positioning and navigation?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform:								
Kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rapid static surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform real-time kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If yes, does it have on-the-fly ambiguity resolution capabilities?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is RTK radio internal or external?	External	Internal	Internal	External	External	External	External	[43]
Use of multiple RTK base stations on a single radio	N/A	Yes	Yes	N/A	N/A	N/A	Yes	Yes
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	No	No	No	No	No	No	No	No
Is the receiver capable of picking up signals from the commercially available DGPS service companies?		30 seconds	30 seconds	Yes, StarFire 30 seconds	Yes, StarFire 30 seconds	Yes, StarFire 30 seconds	No	Yes, OmniStar
Time to first satellite signal lock (seconds)	30 seconds	< 60 seconds	< 60 seconds	< 60 seconds	< 60 seconds	< 60 seconds	< 10 seconds	< 10 seconds
For all available satellites? (seconds)	< 60 seconds	No	No	No	No	No	< 60 seconds	< 60 seconds
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	No						Yes	No
If "Yes," can the system be programmed with information for multiple sessions?							No	
If the system can be preprogrammed, can alphanumeric data be input?							Yes	
Does the receiver give some indication that data is being recorded?							Yes	
Size: (H" x W" x D")	3.1 x 5.7 x 8.2	5.5 H x 10.4 D	3.1 x 5.7 x 8.2	5.5 H x 10.4 D	3.1 x 5.7 x 8.2	3.1 x 5.7 x 8.2	2.5 x 6 x 7	2.5 x 6 x 7
Weight: (lbs. Receiver only)	3.6	5.5	4	5.5	4	4	2.9	2.25
Is antenna included in the weight?	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Weight (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)	[35]	[35]	[35]	[35]	[35]	[35]	Approx. 9	Approx. 9
Receiver housing material (e.g. plastic, metal)	Alloy	Alloy/UV stable plastic	Alloy	Alloy/UV stable plastic	Alloy	Alloy	Aluminum	Aluminum
Humidity proofing (e.g. 95%, 100% non-condensing)	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing	95% non-condensing
Drop height survival (m/ft)		2 m/6 ft		2 m/6 ft			1m	1m
Waterproofing (e.g. IPX5, IPX6, IPX7)							IPX7	IPX7
Operating Temperature Range (degrees F/C)	-40 to 55° C	-40 to 55° C	-40 to 55° C	-40 to 55° C	-40 to 55° C	-40 to 55° C	40 to 141° F (-40 to 55° C)	-40 to 131° F (-40 to 55° C)
Is standard battery internal?	No	Yes	No	Yes	No	No	No	No
Hours of operation at 0 degrees C with standard battery		8		8			9	9
Input voltage range (v)	10 to 30	10 to 30	10 to 30	10 to 30	10 to 30	10 to 30	7 to 18	7 to 18
Power consumption? (watts, receiver only)	< 7	< 10	< 10	< 10	< 10	< 10	< 3	5
Power consumption? (watts complete RTK rover inc. receiver, antenna, radio, controller)	[35]	[35]	[35]	[35]	[35]	[35]	Varies with configuration	Varies with configuration
Has the system (including all components) been tested by the (FGCS)*?	No	No	No	No	No	No	No	No
ANTENNA								
Type:	Drooped dipole	Drooped dipole	Drooped dipole	Drooped dipole	Drooped dipole	FAA certified dipole	SK 600 Pin/Wheel	SK 600 Pin/Wheel
Is antenna built into the receiver?	No	Yes	No	Yes	No	No	No	No
If "Yes," is antenna removable?		No		No				
If it is not removable, is there a provision for an external antenna?		No		No				
Weight, antenna (lbs.)	1	1	1	1	1	1	1.6	1.6
Length of antenna cable furnished with receiver?	10 ft	N/A	10 ft	N/A	10 ft	10 ft	2.5 m	2.5m
Maximum length of antenna cable that can be used?	[36]	N/A	[36]	N/A	[40]	[40]	Custom	Custom
Is a system available for postprocessing data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
U.S. SUGGESTED LIST PRICE (\$)								
Receiver?	Contact NavCom	Contact NavCom	Contact NavCom	Contact NavCom	Contact NavCom	Contact NavCom	Contact SOKKIA	Contact SOKKIA
Antenna?							Contact SOKKIA	Contact SOKKIA
Postprocessing hardware and software?							Contact SOKKIA	Contact SOKKIA
WARRANTY (months)								
Receiver?	12	12	12	12	12	12	12	12
Antenna?	12	12	12	12	12	12	12	12
Postprocessing hardware?	N/A	N/A	N/A	N/A	N/A	N/A	Updates free	
ADVANCED FEATURES	RTK, 50Hz data options	50Hz data option	50Hz data option [37]	RTK, 50Hz data options [39]	RTK, 50Hz data options [37][39]	RTK, 50Hz data options		OmniStar HP capable
READER SERVICE NUMBER	9	10	11	12	13	14	15	16

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MANUFACTURER/DISTRIBUTOR	SOKKIA	Thales Navigation	Thales Navigation	Thales Navigation	Thales Navigation	Thales Navigation	Thales Navigation
RECEIVER MODEL	Radian IS	Aquarius 01/02	iCGRS	MicroZ CGRS	ProMark2	Sagitta 01/02	Z-Max
Manufacturer's phone number	800/255-3913	408/615-5100	800/922-2401	800/922-2401	408/615-5100	408/615-5100	408/615-5100
Receiver tracking characteristics							
Single-frequency or dual-frequency GPS?	Dual	Single/dual	Dual	Dual	Single	Single/dual	Dual
L1 C/A code, L1 carrier		Aquarius01			Yes	Yes (Sagitta01)	Yes
L1 only, codeless							No
L1 only, C/A-code							No
L1 codeless and L2 codeless							No
L1 C/A-code and L2 codeless							No
L1 C/A-code and P-code, L2 P-code		Aquarius02	Yes	Yes		Yes (Sagitta02)	Yes
L1 C/A-code and L2 P-code							Yes
Other	[41]						
GLONASS?	No	No	No	No		No	No
WAAS?	Optional	Yes	No	No	Yes	Yes	No
Max. number of satellites tracked simultaneously	12	12+2	12	12	12	12+2	12
Number of receiver channels	24	16/28	12	12	12	16 (Sagitta01), 28 (Sagitta02)	12
Selectable data interval for phase measurement?	0.05 to 30 seconds		0.1 to 999 seconds	0.1 to 999 seconds	0.1 to 999 seconds		0.1 to 999 seconds
When four satellites are tracked, does the receiver display provide:							
Satellite tracking status?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coordinated Universal Time (UTC)?	Via optional data collector	Yes	No	No	Yes	Yes	Yes
Three-dimensional positions?	Via optional data collector	Yes	No	No	Yes	Yes	Yes
Velocity?	Via optional data collector	Yes	No	No	Yes	Yes	Yes
Dilution of precision?	Via optional data collector	Yes	No	No	Yes	Yes	Yes
Real-time map display with linework and background	Via optional data collector	No	No	No	Yes	No	Yes
Touch screen display?	Via optional data collector	N/A	No	No	No	N/A	Yes
Coordinates in grid, local or ground values? If yes, state which.	Via optional data collector	Yes	No	No	Yes	Yes	Yes
Horizontal Accuracy (Std. Dev.)							
Static (cm)	0.5 cm + 1 ppm		0.3	0.3	0.5		0.5
RTK (cm)	1 cm + 1 ppm	0.5 + 0.5 ppm	N/A	N/A	N/A	0.5 + 0.5ppm	1
Does the receiver accurately measure and output:							
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	Yes	Yes	Yes	Yes	No	Yes (Sagitta02)	Yes
Cross-correlated Y2 - Y1 pseudoranges?	No	No	No	No	No	No	N/A
Other dual-frequency technology	Yes	Yes	Yes	Yes	No	No	Patented Z-tracking
Specify available observables (e.g. L1 C/A, L1 Phase, etc.)	L1/L2 code and carrier		L1/L2 code and carrier	L1/L2 code and carrier	L1/L2 code and carrier		[49]
On what medium is observed data recorded during the observations?			Flash	Flash			Secure digital memory
Internal memory?	CompactFlash card	No	Yes	Yes	Yes	No	Yes
Other medium?	Serial to PC/PDA	Serial to PC	Serial Port to PC	Serial Port to PC	No	Serial PC	
If recorded in the internal memory, what medium is available to transfer to after the observations end? (serial port, IR port, USB port, removable media memory, other)	Eject card, serial download		Serial port to PC	Serial port to PC	Serial port	N/A	[47]
Maximum internal memory capacity (Mb)	Varies with CF card		128	128	8 Mb	N/A	128 Mb
Maximum data transfer speed from internal memory to PC (baud)	115K baud		115,200	115,200	115,200	N/A	3 Mb/second
RECEIVER INTERFACE							
Are the following supported on the single component of the system, which includes the Receiver (Rx), or the controller or handheld computer (C) or both (B).							
Alpha-numeric entry of data	C	Rx	C	C	Rx	Rx	B
Text warnings	C	Rx	C	C	Rx	Rx	B
Setting of receiver parameters	C	Rx	C	C	Rx	Rx	B
Receiver status	B	Rx	C	C	Rx	Rx	B
Messages formed with LEDs	Rx	N/A	No	No	N/A	N/A	Rx
Messages formed with LCDs	C	Rx	No	No	Rx	Rx	C
Can receiver be used in a vehicle for positioning and navigation?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform:							
Kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rapid static surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform real-time kinematic surveys?	Yes	Yes	No	No	No	Yes	Yes
If yes, does it have on-the-fly ambiguity resolution capabilities?	Yes	Yes			N/A	Yes	Yes
Is RTK radio internal or external?	External	Internal			N/A	Internal	Modular
Use of multiple RTK base stations on a single radio	Yes	Yes			N/A	Yes	Yes
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	Yes	No	No	Yes	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	No	Yes	No	No	No	Yes	No
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	No	Yes	No	No	No	Yes	
Time to first satellite signal lock (seconds)	< 10 seconds	< 30 seconds	5 seconds	5 seconds	10 seconds	< 30 seconds	5 seconds
For all available satellites? (seconds)	< 60 seconds	< 60 seconds	30 seconds	30 seconds	30 seconds	< 60 seconds	20 seconds
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	Yes	No	Yes	Yes	Yes	No	Yes
If Yes, can it be done by a person other than the user?	No		Yes	Yes	No		Yes
If the system can be preprogrammed, can alphanumeric data be input?	Yes	Yes	Yes	Yes	Yes	No	Yes
Does the receiver give some indication that data is being recorded?	Yes	No	Yes	Yes	Yes	No	Yes
Size: (H"x"W"x"D")	6.5 x 9 (D)	4.9 x 9.6 x 12	2.5 x 7 x 9.6	2.5 x 7 x 9.6	6.2 x 2 x 1.3	2.7 x 10.4 x 8.5	
Weight: (lbs. Receiver only)	3.3	9.3	3.75	3.75	0.32	4.4	2.5
Is antenna included in the weight?	Yes	No	No	No	No	No	No
Weight (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)	Approx. 9		N/A	N/A	2.5		7
Receiver housing material (e.g. plastic, metal)	Plastic	Metal	Metal	Metal	Plastic	Metal	Magnesium alloy
Humidity proofing (e.g. 95%, 100% non-condensing)	95% non-condensing		100% non-condensing	100% non-condensing	100% non-condensing		
Drop height survival (m/ft)	2m pole		N/A		1.5 m		1.5 m
Waterproofing (e.g. IPX5, IPX6, IPX7)	IPX7	IP52	Mil Std 810E	Mil Std 810E	IPX7	IP52	IPX5
Operating Temperature Range (degrees F/C)	-40 to 131° F (-40 to 55° C)	-20 to 55° C	-40 to 55° C	-40 to 60° C	-10 to 60° C	-20; 55° C	-30 to 55° C
Is standard battery internal?	Yes	No	No	No	Yes	No	Modular
Hours of operation at 0 degrees C with standard battery	5		N/A	N/A	8		14
Input voltage range (v)	9 to 18	9 to 36 VDC	10 to 28	10 to 28	N/A	9 to 36 VDC	10 to 24
Power consumption? (watts, receiver only)	< 3	< 10	6.6	5.6	0.35	< 7	5
Power consumption? (watts complete RTK rover inc. receiver, antenna, radio, controller)	Varies with configuration	> 21	N/A	N/A	N/A	< 16	5.5
Has the system (including all components) been tested by the (FGCS)*?	No	No	No	No	Yes	No	Test scheduled
ANTENNA							
Type:	Internal Pin/Wheel	NAP001 / NAP002	Chokering	Chokering	Patch	NAP001 / NAP002	Precision patch
Is antenna built into the receiver?	Yes	No	No	No	Yes	No	Modular
If Yes, is it removable/reconfigurable?	No				No		Yes
If it is not removable, is there a provision for an external antenna?	No		Yes	Yes	Yes	Yes	Yes
Weight, antenna (lbs.)	Internal	0.8	9.4	9.4	0.45	0.77	1.17
Length of antenna cable furnished with receiver?		30 m	30 m	30 m	4 ft	30m	3 m
Maximum length of antenna cable that can be used?			60 m	60 m	4 ft		30 m
Is a system available for postprocessing data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
U.S. SUGGESTED LIST PRICE (\$)			On request	On request	Call for best pricing		Call for best pricing
Receiver?	Contact SOKKIA		On request	On request	Call for best pricing		Call for best pricing
Antenna?	Contact SOKKIA		On request	On request	Call for best pricing		Call for best pricing
Postprocessing hardware and software?	Contact SOKKIA		On request	On request	Call for best pricing		Call for best pricing
WARRANTY (months)		12	12	12	12 months limited warranty	12	12 months limited
Receiver?	12	12	12	12	Yes	12	12 months limited
Antenna?	12	12	12	12	Yes	12	12 months limited
Postprocessing hardware?	Updates free	N/A	12	12	N/A		12 months limited
ADVANCED FEATURES		[44][75]	[45]	[46]		[44]	[48]
READER SERVICE NUMBER	18	19	20	21	22	23	24

*Federal Geodetic Control Subcommittee
Numbers in brackets refer to notes on page 49.

POB 2004 GPS Equipment Survey – Geodetic Receivers

MANUFACTURER/DISTRIBUTOR	Topcon	Topcon	Topcon	Topcon	Topcon	Topcon	Topcon
RECEIVER MODEL	GB-500	GB-1000	Hiper+	Hiper Lite+	Hiper Pro	Legacy-E	Odyssey-E
Manufacturer's phone number	800/443-4567	800/443-4567	800/443-4567	800/443-4567	800/443-4567	800/443-4567	800/443-4567
Receiver tracking characteristics							
Single-frequency or dual-frequency GPS?	Dual	Dual	Dual	Dual	Dual	Dual	Dual
L1 C/A code, L1 carrier							
L1 only, codeless							
L1 only, C/A-code							
L1 codeless and L2 codeless							
L1 C/A-code and L2 codeless							
L1 C/A-code and P-code, L2 P-code							
L1 C/A-code and L2 P-code							
Other							
GLONASS?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WAAS?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Max. number of satellites tracked simultaneously	20	20	20	20	20	20	20
Number of receiver channels	40	40	40	40	40	40	40
Selectable data interval for phase measurement?	1 to 20 Hz	1 to 20 Hz	1 to 20 Hz	1 to 20 Hz	1 to 20 Hz	1 to 20 Hz	1 to 20 Hz
When four satellites are tracked, does the receiver display provide:							
Satellite tracking status?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coordinated Universal Time (UTC)?	Yes (with data collector)	Yes	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)
Three-dimensional positions?	Yes (with data collector)	Yes	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)
Velocity?	Yes (with data collector)	Yes	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)
Dilution of precision?	Yes (with data collector)	Yes	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)
Real-time map display with linework and background	No	No	No	No	No	No	Yes
Touch screen display?	No	No	No	No	No	No	Yes
Coordinates in grid, local or ground values? If yes, state which.	Yes (with data collector)	Yes	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes (with data collector)	Yes
Horizontal Accuracy (Std. Dev.)							
Static (cm)	[50]	[50]	[50]	[51]	[50]	[50]	[52]
RTK (cm)	[53]	[53]	[53]	[54]	[55]	[55]	[55]
Does the receiver accurately measure and output:							
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cross-correlated Y2 - Y1 pseudoranges?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other dual-frequency technology	Yes	Yes	Yes	Yes	Yes	GLONASS	Yes
Specify available observables (e.g. L1 C/A, L1 Phase, etc.)	[56]	[56]	[56]	[56]	[56]	[56]	[56]
On what medium is observed data recorded during the observations?							
Internal memory?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other medium?	Yes (external PC)	CF card slot & external PC	Yes (external PC)	Yes (external PC)	Yes (external PC)	Yes (external PC)	Yes (external PC)
If recorded in the internal memory, what medium is available to transfer to after the observations end? (serial port, IR port, USB port, removable media memory, other)	Serial, USB	Serial, USB, Ethernet	Serial, USB	Serial, USB	Serial, USB	Serial	Serial, USB, IR, Ethernet
Maximum internal memory capacity (Mb)	Up to 1000	Up to 1000	Up to 1000	1000	1000	1000	1000
Maximum data transfer speed from internal memory to PC (baud)	Up to 460,800	Up to 460,800	Up to 460,800	Up to 460,800	Up to 460,800	460,800	Up to 460,800
RECEIVER INTERFACE							
Are the following supported on the single component of the system, which includes the Receiver (Rx), or the controller or handheld computer (C) or both (B).							
Alpha-numeric entry of data	C	C	C	C	C	C	Rx
Text warnings	C	Rx	C	C	C	C	Rx
Setting of receiver parameters	B	Rx	B	B	B	B	Rx
Receiver status	B	Rx	B	B	B	B	Both
Messages formed with LEDs	Rx	Rx	Rx	Rx	Rx	Rx	Rx
Messages formed with LCDs	C	Rx	C	C	C	C	Rx
Can receiver be used in a vehicle for positioning and navigation?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform:							
Kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rapid static surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform real-time kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If yes, does it have on-the-fly ambiguity resolution capabilities?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is RTK radio internal or external?	External	External	Internal	Internal (spread spectrum)	Internal	External	Internal
Use of multiple RTK base stations on a single radio	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	Yes [57]	Yes [57]	Yes [57]	Yes [57]	Yes [57]	Yes [57]	Yes
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	Yes [58]	Yes [58]	Yes [58]	Yes [58]	Yes [58]	Yes [58]	Yes
Time to first satellite signal lock (seconds)	< 1 seconds	< 1 seconds	< 1 seconds	< 1 seconds	< 1 seconds	< 1 seconds	< 1 second
For all available satellites? (seconds)	10 seconds	10 seconds	< 10 seconds	10 seconds	10 seconds	10 seconds	10 seconds
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If "Yes," can the system be programmed with information for multiple sessions?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If the system can be preprogrammed, can alphanumeric data be input?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Does the receiver give some indication that data is being recorded?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size: (H" x W" x D")	10.1 x 5.9 x 2.5	5.9 x 10.1 x 2.5	6.75 x 6.25 x 3.5	6.75 x 6.25 x 3.5	6.75 x 6.25 x 3.5	4.33 x 9.45 x 1.38	9.53 x 6.25 x 1.93
Weight: (lbs. Receiver only)	2.2	2.2	3.6	3.6	3.6	1.32	4.19
Is antenna included in the weight?	No	No	Yes	Yes	Yes	No	No
Weight (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)	Approx. 5	Approx. 5	Approx. 5	Approx. 5	Approx. 5	Approx. 5	Approx. 7
Receiver housing material (e.g. plastic, metal)	Plastic	Plastic	Aluminum/plastic	Aluminum/plastic	Aluminum/plastic	Aluminum	Aluminum
Humidity proofing (e.g. 95%, 100% non-condensing)	100%	100%	Waterproof	Waterproof	Waterproof	Waterproof	Waterproof
Drop height survival (m/ft)	2 m	2m				2m	
Waterproofing (e.g. IPX5, IPX6, IPX7)	IP66	IP66					
Operating Temperature Range (degrees F/C)	-20 to 55° C	-20 to 55° C	-40 to 55° C	-40 to 55° C	-40 to 55° C	-40 to 55° C	-40 to 55° C
Is standard battery internal?	Yes	Yes	Yes	Yes	Yes	No	Yes
Hours of operation at 0 degrees C with standard battery	7	7	> 12	> 10 with TX on	> 8	8	20
Input voltage range (v)	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28	6 to 28
Power consumption? (watts, receiver only)	< 4	< 4	< 3.3	< 5	< 5	< 3.3	< 3
Power consumption? (watts complete RTK rover inc. receiver, antenna, radio, controller)	< 5	< 5	< 4	< 5	< 6	4	< 4.3
Has the system (including all components) been tested by the (FGCS)*?	No	No	No	No	No	Yes	No
ANTENNA							
Type:	PG-A1 (zero centered)	PG-A1 (zero centered)	Microstrip	Microstrip	Microstrip	PG-A1	Legant-3/PG-A2 (zero centered)
Is antenna built into the receiver?	No	No	Yes	Yes	Yes	No	No
If "Yes," is antenna removable?			No	No	No		
If it is not removable, is there a provision for an external antenna?			Yes (optional)	Yes (optional)	Yes (optional)		
Weight, antenna (lbs.)	1	1		1	1	1	1
Length of antenna cable furnished with receiver?	3 m	1 m				3 m	3 m
Maximum length of antenna cable that can be used?	30 m (without line amplifier)	30 m (without line amplifier)	30 m (without line amplifier)	30 m (without line amplifier)	30 m	30 m (without line amplifier)	30 m (without line amplifier)
Is a system available for postprocessing data?	Yes	Yes	Yes	Yes		Yes	Yes
U.S. SUGGESTED LIST PRICE (\$)							
Receiver?	\$5,500+	\$6,000+	\$8,100+	\$13,700		From \$4,500	\$13,000
Antenna?	\$2,195+	\$2,195+		Included		From \$2,195	\$2,495
Postprocessing hardware and software?	\$2,000 - \$8,000	\$2,000 - \$8,000	\$2,000 - \$8,000	\$2,000 - \$3,500		\$2,000 - \$8,000	\$2,000 - \$8,000
WARRANTY (months)							
Receiver?	12	12	12	12	12	12 months	12
Antenna?	12	12	12	12	12	12 months	12
Postprocessing hardware?						N/A	
ADVANCED FEATURES	[59]	[60]	[61]	[62]	[63]	[64]	[65]
READER SERVICE NUMBER	25	26	27	28	29	30	31

*Federal Geodetic Control Subcommittee
Numbers in brackets refer to notes on page 49.

POB 2004 GPS Equipment Survey – Geodetic Receivers

MANUFACTURER/DISTRIBUTOR	Topcon	Trimble	Trimble	Trimble	Trimble	Trimble	Trimble
RECEIVER MODEL	Odyssey R5	Trimble 4600LS	Trimble 5700	Trimble 5800	Trimble NetRS	Trimble R7	Trimble R8
Manufacturer's phone number	800/443-4567	800/538-7800	800/538-7800	800/538-7800	800/538-7800	800/538-7800	800/538-7800
Receiver tracking characteristics							
Single-frequency or dual-frequency GPS?	Dual	Single	Dual	Dual	Dual	Dual	Dual
L1 C/A code, L1 carrier							
L1 only, codeless							
L1 only, C/A-code							
L1 codeless and L2 codeless							
L1 C/A-code and L2 codeless							
L1 C/A-code and P-code, L2 P-code							
L1 C/A-code and L2 P-code							
Other		[68]	[68][74]	[68][74]	[68][74]	[68][74]	[68][74]
GLONASS?	Yes	No	No	No	No	No	No
WAAS?	Yes	No	Yes	Yes	Yes	Yes	Yes
Max. number of satellites tracked simultaneously	20	12	12	12	12	12	12
Number of receiver channels	40	12	24	24	24	24	24
Selectable data interval for phase measurement?	1 to 20 Hz	Yes [69]	Yes [76]	Yes [76]	Yes [93]	Yes [76]	Yes [76]
When four satellites are tracked, does the receiver display provide:							
Satellite tracking status?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coordinated Universal Time (UTC)?	Yes	Yes [70]	Yes [70]	Yes [70]	Yes [70]	Yes [70]	Yes [70]
Three-dimensional positions?	Yes	Yes [70]	Yes [70]	Yes [70]	Yes [70]	Yes [70]	Yes [70]
Velocity?	Yes	Yes [70]	Yes [70]	Yes [70]	N/A	Yes [70]	Yes [70]
Dilution of precision?	Yes	Yes [70]	Yes [70]	Yes [70]	Yes [70]	Yes [70]	Yes [70]
Real-time map display with line work and background	No	Yes [70]	Yes [70]	Yes [70]	N/A	Yes [70]	Yes [70]
Touch screen display?	No	Yes [70]	Yes [70]	Yes [70]	N/A	Yes [70]	Yes [70]
Coordinates in grid, local or ground values? If yes, state which.	Yes	Yes [71]	Yes [71]	Yes [71]	N/A	Yes [71]	Yes [71]
Horizontal Accuracy (Std. Dev.)							
Static (cm)	[52]	± 0.5 cm + 1 ppm RMS	± 0.5 cm + 0.5 ppm RMS	± 0.5 cm + 0.5 ppm RMS	± 0.5 cm + 0.5 ppm RMS	± 0.5 cm + 0.5 ppm RMS	± 0.5 cm + 0.5 ppm RMS
RTK (cm)	[55]	N/A	± 1.0 cm + 1 ppm RMS	± 1.0 cm + 1 ppm RMS	N/A	± 1.0 cm + 1 ppm RMS	± 1.0 cm + 1 ppm RMS
Does the receiver accurately measure and output:							
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Cross-correlated Y2 - Y1 pseudoranges?	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Other dual-frequency technology	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Specify available observables (e.g. L1 C/A, L1 Phase, etc.)	[56]	[72]	[83]	[83]	[83]	[72]	[72]
On what medium is observed data recorded during the observations?							
Internal memory?	Yes	Internal RAM memory	Removable Compact Flash	Internal RAM memory	Internal RAM memory	Removable Compact Flash	Internal RAM memory
Other medium?	Yes (external PC)	Internal RAM memory	Removable Compact Flash	Internal RAM memory	Internal RAM memory	Removable Compact Flash	Internal RAM memory
If recorded in the internal memory, what medium is available to transfer to after the observations end? (serial port, IR port, USB port, removable media memory, other)	Serial, USB, IR, Ethernet	Direct to PC or data collector	Direct to PC or data collector	Direct to PC or data collector	Direct to PC	Direct to PC or data collector	Direct to PC or data collector
Maximum internal memory capacity (Mb)	1,000	1 Mb [77]	Varies [85]	2 Mb [94]	150 Mb [100]	Varies [85]	6 Mb [107]
Maximum data transfer speed from internal memory to PC (baud)	Up to 460,800	38,400	USB: 1 Megabit / Sec	115,200	Ethernet	USB: 1 Mb/Sec	115,200
RECEIVER INTERFACE							
Are the following supported on the single component of the system, which includes the Receiver (Rx), or the controller or handheld computer (C) or both (B).							
Alpha-numeric entry of data	C	C	C	C	C	C	C
Text warnings	C	C	C	C	C	C	C
Setting of receiver parameters	B	B	B	C	C	B	C
Receiver status	B	B	B	B	B	B	B
Messages formed with LEDs	Rx	Rx	Rx	Rx	Rx	Rx	Rx
Messages formed with LCDs	C	C	C	C	C	C	C
Can receiver be used in a vehicle for positioning and navigation?	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Can the receiver perform:							
Kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-kinematic surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rapid static surveys?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can the receiver perform real-time kinematic surveys?	Yes	N/A	Yes	Yes	Yes [101]	Yes	Yes
If yes, does it have on-the-fly ambiguity resolution capabilities?	Yes		Yes	Yes		Yes	Yes
Is RTK radio internal or external?	Internal or external		Yes, both available	Yes, both available		Yes, both available	Yes, both available
Use of multiple RTK base stations on a single radio	Yes		Yes	Yes		Yes	Yes
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	N/A	Yes	Yes	Yes [101]	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	Yes [57]		Yes	Yes		Yes	Yes
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	Yes [58]		Yes	Yes		Yes	Yes
Time to first satellite signal lock (seconds)	< 1 second		< 10 seconds	< 10 seconds	< 10 seconds	< 10 seconds	< 10 seconds
For all available satellites? (seconds)	10 seconds		< 30 seconds	< 30 seconds	< 30 seconds	< 30 seconds	< 30 seconds
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
If "Yes," can the system be programmed with information for multiple sessions?	Yes	Controlled by data collector	Yes	Controlled by data collector	Yes	Yes	Controlled by data collector
If the system can be preprogrammed, can alphanumeric data be input?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Does the receiver give some indication that data is being recorded?	Yes	Yes, color LED indication	Yes, color LED indication	Yes, color LED indication	Yes, color LED indication	Yes, color LED indication	Yes, color LED indication
Size: (H" x W" x D")	9.53 x 6.25 x 1.93	[78]	[86]	[95]	[102]	[86]	[95]
Weight: (lbs. Receiver only)	4.19	[79]	[87]	[96]	[103]	[87]	[96]
Is antenna included in the weight?	No	Yes	[88]	Yes	No, varies [88]	No, varies [88]	Yes
Weight (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)	Approx. 6	N/A	[89]	[97]	[101]	[89]	[97]
Receiver housing material (e.g. plastic, metal)	Aluminum	Hardened plastic	Magnesium alloy	Hardened plastic	Composite metal extrusion	Magnesium alloy	Hardened plastic
Humidity proofing (e.g. 95%, 100% non-condensing)	Waterproof	[80]	[90]	[90]	[105]	[80]	[80]
Drop height survival (m/ft)		[81]	[91]	[98]	[98]	[91]	[98]
Waterproofing (e.g. IPX5, IPX6, IPX7)		MIL-SPEC-810E	IPX7	IPX7	IPX5	IPX7	IPX7
Operating Temperature Range (degrees F/C)	-40 to 55° C	-40 to 65° C (-40 to 149° F)	-40 to 65° C (-40 to 149° F)	-40 to 65° C (-40 to 167° F)	-40 to 65° C (-40 to 149° F)	-40 to 65° C (-40 to 149° F)	-40 to 65° C (-40 to 149° F)
Is standard battery internal?	Yes	Yes	Yes	Yes	No	Yes	Yes
Hours of operation at 0 degrees C with standard battery	20	> 32 with C-cell batteries	> 5.5 using single battery	> 5.5 using single battery	24/7 [101]	> 5.5 using single battery	> 5.5 using single battery
Input voltage range (v)	6 to 28	9 to 20 VDC	11 to 28 VDC (ports 2, 3)	11 to 28 VDC (port 1)	11 to 28 VDC	11 to 28 VDC (ports 2, 3)	11 to 28 VDC (port 1)
Power consumption? (watts, receiver only)	< 3	< 1	2.5	< 2.5	[106]	2.5	< 2.5
Power consumption? (watts complete RTK rover inc. receiver, antenna, radio, controller)	< 4.3	N/A	3.75	< 3.75	[101]	3.75	< 3.75
Has the system (including all components) been tested by the (FGCS)*?	No	Yes	Yes	See Trimble 5700	No	See Trimble 5700	See Trimble 5700
ANTENNA							
Type:	[66]	4600LS Internal	Varies [88]	5800 Internal	Varies [88]	Varies [88]	Trimble R8 internal
Is antenna built into the receiver?	No	Yes	No	Yes	No	No	Yes
If "Yes," is antenna removable?		No	N/A	No	N/A	N/A	No
If it is not removable, is there a provision for an external antenna?		No	N/A	No	N/A	N/A	No
Weight, antenna (lbs.)	1	Included in receiver weight	Varies [88]	Included in receiver weight	Varies [88]	Varies [88]	Included in receiver weight
Length of antenna cable furnished with receiver?	3 m	Cable free	10 m (30 ft)	Cable free	10 m (30 ft)	10 m (30 ft)	Cable free
Maximum length of antenna cable that can be used?	30 m (without line amplifier)	Cable free	[92]	Not required	[92]	Not required	Not required
Is a system available for postprocessing data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
U.S. SUGGESTED LIST PRICE (\$)		Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer
Receiver?		Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer
Antenna?		Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer
Postprocessing hardware and software?	\$2,000 - \$8,000	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble dealer
WARRANTY (months)		12	12	12	12	12	12
Receiver?	12	12	12	12	12	12	12
Antenna?	12	12	12	12	12	12	12
Postprocessing hardware?	12	12	12	12	12	12	12
ADVANCED FEATURES	[67]	[82]	[82]	[82]	[82]	[82]	[82]
READER SERVICE NUMBER	32	33	34	35	36	37	38

*Federal Geodetic Control Subcommittee
Numbers in brackets refer to notes on page 49.

POB 2004 GPS Equipment Survey – Mapping/Positioning Receivers

MANUFACTURER/DISTRIBUTOR	Leica Geosystems	Leica Geosystems	Leica Geosystems	NavCom Technology Inc.	NavCom Technology Inc.	NavCom Technology Inc.
RECEIVER MODEL	GS5	GS5+	GS20 PDM [4]	SF-2000R	SF-2040G	SF-2050G
Manufacturer's Phone Number	800/367-9453	800/367-9453	800/367-9453	310/381-2000	310/381-2000	310/381-2000
Receiver tracking characteristics						
L1 C/A code, L1 carrier	Yes	Yes	Yes	Yes	Yes	Yes
L1 only, C/A-code	Yes	Yes	Yes			
L1 codeless and L2 codeless	No	No	No			
Other			Integrated WAAS tracking	P1, L2 Phase, P2	P1, L2 Phase, P2	P1, L2 Phase, P2
Max. number of satellites tracked simultaneously	12	12	12	10 GPS + 2 SBAS	10 GPS + 2 SBAS	10 GPS + 2 SBAS
Number of receiver channels	12	12	12	20 GPS + 2 SBAS	20 GPS + 2 SBAS	20 GPS + 2 SBAS
When four satellites are tracked, does the receiver display provide:						
Coordinated Universal Time (UTC)?	Yes	Yes	Yes	Yes [6]	Yes [6]	Yes [6]
Three-dimensional positions?	Yes	Yes	Yes	Yes [6]	Yes [6]	Yes [6]
Velocity?	Yes	Yes	Yes	Yes [6]	Yes [6]	Yes [6]
Dilution of precision?	Yes	Yes	Yes	Yes [6]	Yes [6]	Yes [6]
Graphical display indicating GPS/DGPS status?	Yes	N/A	Yes	Yes [6]	Yes [6]	Yes [6]
Horizontal Accuracy (Std. Dev.)						
Post-processed differential (m)	N/A	N/A	0.30 m 2D rms	0.5 + 1 ppm	0.5 + 1 ppm	0.5 + 1 ppm
Real-time differential (m)	1-2 m	< 1 m	0.40 m 2D rms	1.0 + 1 ppm	1 + 1 ppm	1 + 1 ppm
Does the receiver accurately measure and output:						
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	No	No	No	Yes	Yes	Yes
Cross-correlated Y2 - Y1 pseudoranges?	No	No	No	No	No	No
Other dual-frequency technology	No	No	No	Yes	Yes	Yes
On what medium is observed data recorded during the observations?	N/A	N/A	Compact Flash			
Internal memory?	N/A	No	No	No	Yes	Yes
Other medium?	N/A	N/A	Compact Flash	Serial to PC/PDA	Serial to PC/PDA	Serial to PC/PDA
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	Yes	Yes	Yes	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	Any RTCM	Built-in	Yes	No	No	No
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	Any RTCM	No	Yes	Yes, StarFire	Yes, StarFire	Yes, StarFire
Is receiver capable of using WAAS corrections?	No	No	Yes	Yes	Yes	Yes
To lock on the GPS signals, does the system require a reference position?	No	No	No, but recommended	No	No	No
If "Yes," how accurate (e.g., 100m, 30km, etc.):						
Horizontal position?						
Vertical position?						
Time to first satellite signal lock? (seconds)	10	10	10	30	30	30
For all available satellites? (seconds)	45	45	45	90	< 60	< 60
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	N/A	No	Yes	No	No	No
If "Yes," can the system be programmed with information for multiple sessions?			Yes			
Size: (H" x W" x D")	3.5 x 5.5 x 5.5	3.5 x 5.5 x 5.5	8.46 x 3.54 x 1.97	7.25 H x 8.2 D	5.5 H x 10.4 D	3.1 x 5.7 x 8.2
Number of serial ports	1	1	1 + 2 via Bluetooth	2 + CAN	2	2
Material receiver is constructed of	Plastic composite	Plastic composite	Polycarbonate	Alloy/UV stable plastic	Alloy/UV stable plastic	Alloy
Weight: (lbs.)	1.3	1.45	1.4	3.8	5.5	4
Is antenna included in the weight?	Yes	Yes	Yes	Yes	Yes	Yes
Weight: (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)			1.4	N/A	[7]	[7]
ANTENNA						
Type:	Integrated	Integrated	Internal: Leica AT575	Patented turnstyle	Drooped dipole	Drooped dipole
Other?		No	External Leica AT501	No	No	No
Is antenna built into the receiver?	Yes	Yes	Yes	Yes	Yes	No
If "Yes," is antenna removable?	No	No	No	No	No	
Weight, antenna (lbs.)		N/A		N/A	N/A	1
Length of antenna cable furnished with receiver?	1.8 m	1.8 m	N/A	N/A	N/A	10 ft
POSTPROCESSOR						
Is a system available for postprocessing data in the field?	No	No	Yes	Not required [8]	Not required [8]	Not required [8]
U.S. SUGGESTED LIST PRICE (\$)	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact NavCom	Contact NavCom	Contact NavCom
Receiver?	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems			
Antenna?	N/A	N/A	Contact Leica Geosystems			
Postprocessing hardware and software?	N/A	N/A	Contact Leica Geosystems			
Postprocessing software (only)?	N/A	N/A	Contact Leica Geosystems			
WARRANTY(months)	12	12	12			
Receiver?	12	12	12	12	12	12
Antenna?	12	12	12	12	12	12
Postprocessing hardware?	N/A	N/A	12			
ADVANCED FEATURES	[1][2][3]	[1][2]	[5]	Real-time decimeter accuracy [8]	Real-time decimeter accuracy [8]	Real-time decimeter accuracy [8][9]
READER SERVICE NUMBER	39	40	41	42	43	44

Numbers in brackets refer to notes on page 49.

POB 2004 GPS Equipment Survey – Mapping/Positioning Receivers

MANUFACTURER/DISTRIBUTOR	SOKKIA	SOKKIA	SOKKIA	Thales Navigation	Thales Navigation	Topcon
RECEIVER MODEL	Axis3	GPS01	GSR2650 LB	MobileMapper	MobileMapper CE	Turbo GII
Manufacturer's Phone Number	800/255-3913	800/255-3913	800/255-3913	408/615-5100	909/394-5000	800/443-4567
Receiver tracking characteristics						
L1 C/A code, L1 carrier				Yes	Yes	Yes
L1 only, C/A-code	Yes	Yes		Yes	Yes	
L1 codeless and L2 codeless				No	No	
Other			L1/L2 code and carrier	No	WAAS/EGNOS	WAAS/EGNOS
Max. number of satellites tracked simultaneously	12	12	12 + Omnistar	12	14	20
Number of receiver channels	12	12	25	12	14	40
When four satellites are tracked, does the receiver display provide:						
Coordinated Universal Time (UTC)?	Via IMap controller software	Via IMap controller software	Via IMap controller software	Yes	Yes	Yes
Three-dimensional positions?	Via IMap controller software	Via IMap controller software	Via IMap controller software	Yes	Yes	Yes
Velocity?	Via IMap controller software	Via IMap controller software	Via IMap controller software	Yes	Yes	Yes
Dilution of precision?	Via IMap controller software	Via IMap controller software	Via IMap controller software	Yes	Yes	Yes
Graphical display indicating GPS/DGPS status?	Via IMap controller software	Via IMap controller software	Via IMap controller software	Yes	Yes	Yes
Horizontal Accuracy (Std. Dev.)						
Post-processed differential (m)	0.5 m 2 DRMS			< 1 m [10]	N/A	
Real-time differential (m)	< 1 m 2 DRMS	2-3 m	OmniStar HP 10 cm CEP	2-3 m	Submeter	< 1 m
Does the receiver accurately measure and output:						
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	No	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	No	Yes	No	No	Yes
Pseudo-range data?	Yes	Yes	Yes	Yes	No	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	No	No	Yes	No	N/A	
Cross-correlated Y2 - Y1 pseudoranges?	No	No	No	No	N/A	
Other dual-frequency technology	No	No	Yes	No	N/A	
On what medium is observed data recorded during the observations?				SD card		Flash card
Internal memory?	No	Yes	No	Yes	Yes	No
Other medium?	Handheld controller	CF or SD memory card	Serial to PC/PDA	No	SD card	
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	Yes	Yes	Yes	Yes	
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	Yes	No	No	Yes	Yes, using MobileMapper Beacon	
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	Yes, Omnistar	No	Yes, Omnistar	Yes	Yes	
Is receiver capable of using WAAS corrections?	Yes	Yes	Yes	Yes	Yes	Yes
To lock on the GPS signals, does the system require a reference position?	No	No	No	No	No	No
If "Yes," how accurate (e.g., 100m, 30km, etc.):						
Horizontal position?						
Vertical position?				No		
Time to first satellite signal lock? (seconds)	< 60 seconds	45 seconds		15 seconds	15	60
For all available satellites? (seconds)	No	No	No	15 seconds	15	
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?				Yes	N/A	Yes
If "Yes," can the system be programmed with information for multiple sessions?				No		Yes
Size: (H" x W" x D")	2.0 x 4.9 x 7.4	8.6 x 3.6 x 1.6	2.5 x 6 x 7	6.5 x 2.9 x 1.2	7.7 x 3.5 x 1.8	
Number of serial ports	2	1	3	1	1	1
Material receiver is constructed of			Aluminum	Polymer	PC/ABS with rubber overmold	Plastic
Weight: (lbs.)	1.68	1.4 (with battery)	2.25	0.48	1.01	
Is antenna included in the weight?	No	Yes	No	Yes	Yes	Yes
Weight: (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)			Approx. 9 lbs	N/A	N/A	
ANTENNA						
Type:	Axis3 Antenna	Internal	SK 600 LB PinWheel	Quadrifilar	Quadrifilar	Integrated in receiver
Other?				Optional patch	Optional external patch antenna	
Is antenna built into the receiver?	No	Yes	No	Yes	Yes	Yes
If "Yes," is antenna removable?		No		No	No	No
Weight, antenna (lbs.)	1.68		1.6		N/A	
Length of antenna cable furnished with receiver?	Varies		2.5 m	N/A	N/A	
POSTPROCESSOR						
Is a system available for postprocessing data in the field?	Yes	No	No	Yes	N/A	
U.S. SUGGESTED LIST PRICE (\$)				\$1,595	\$2,195	
Receiver?	Contact SOKKIA	Contact SOKKIA	Contact SOKKIA	Included in price	\$2,195	
Antenna?	Contact SOKKIA	Contact SOKKIA	Contact SOKKIA	Included in price	N/A	
Postprocessing hardware and software?	Contact SOKKIA		Contact SOKKIA	PP option @ \$795	N/A	
Postprocessing software (only)?	Contact SOKKIA		Contact SOKKIA	N/A	N/A	
WARRANTY(months)						
Receiver?	12	12	12	12	12	12
Antenna?	12	12	12	12	12	12
Postprocessing hardware?	Updates free			N/A	N/A	
ADVANCED FEATURES			OmniStar HP capable	[11]	[12]	[13]
READER SERVICE NUMBER	45	46	47	48	49	50

Numbers in brackets refer to notes on page 49.

POB 2004 GPS Equipment Survey – Mapping/Positioning Receivers

MANUFACTURER/DISTRIBUTOR	Topcon	Trimble	Trimble	Trimble	Trimble	Trimble
RECEIVER MODEL	GMS-100	GeoXM	GeoXT	GPS Pathfinder Power	GPS Pathfinder Pro XR	GPS Pathfinder Pro XRS
Manufacturer's Phone Number	800/443-4567	720/887-4374	720/887-4374	720/887-4374	720/887-4374	720/887-4374
Receiver tracking characteristics						
L1 C/A code, L1 carrier	Yes		Yes	Yes	Yes	Yes
L1 only, C/A-code		Yes				
L1 codeless and L2 codeless						
Other						
Max. number of satellites tracked simultaneously	20	8	12	12	12	12
Number of receiver channels	40	8	12	12	12	12
When four satellites are tracked, does the receiver display provide:						
Coordinated Universal Time (UTC)?	Yes	Yes	Yes	Yes	Yes	Yes
Three-dimensional positions?	Yes	Yes	Yes	Yes	Yes	Yes
Velocity?	Yes	Yes	Yes	Yes	Yes	Yes
Dilution of precision?	Yes	Yes	Yes	Yes	Yes	Yes
Graphical display indicating GPS/DGPS status?	Yes	Yes	Yes	Yes	Yes	Yes
Horizontal Accuracy (Std. Dev.)						
Post-processed differential (m)		2-5 m	Submeter	Submeter	50 cm	50 cm
Real-time differential (m)	< 1 m	2-5 m	Submeter	Submeter	Submeter	Submeter
Does the receiver accurately measure and output:						
Code Phase?	Yes	Yes	Yes	Yes	Yes	Yes
Carrier Phase?	Yes	N/A	Yes	Yes	Yes	Yes
Integrated Doppler?	Yes	N/A	Yes	Yes	Yes	Yes
Pseudo-range data?	Yes	N/A	Yes	Yes	Yes	Yes
Full wavelength L2 carrier-phase data when A/S is implemented?	No	N/A	N/A	N/A	N/A	N/A
Cross-correlated Y2 - Y1 pseudoranges?	No	N/A	N/A	N/A	N/A	N/A
Other dual-frequency technology		N/A	N/A	N/A	N/A	N/A
On what medium is observed data recorded during the observations?		Non-volatile flash	Non-volatile flash	Depends on datalogger	Depends on datalogger	Depends on datalogger
Internal memory?	Yes	Yes	Yes	Depends on datalogger	Depends on datalogger	Depends on datalogger
Other medium?	External PC or controller	No		Depends on datalogger	Depends on datalogger	Depends on datalogger
Can the receiver perform real-time Differential GPS (DGPS)?	Yes	Yes	Yes	Yes	Yes	Yes
Is the receiver capable of picking up signals from U.S. Coast Guard beacons?	Yes	Yes [15]	Yes [15]	No	Yes	Yes
Is the receiver capable of picking up signals from the commercially available DGPS service companies?	Yes, Omnistar	No	No	Yes	No	Yes
Is receiver capable of using WAAS corrections?	Yes	Yes	Yes	Yes	Yes	Yes
To lock on the GPS signals, does the system require a reference position?	No	No	No	No	No	No
If "Yes," how accurate (e.g., 100m, 30km, etc.):						
Horizontal position?						
Vertical position?						
Time to first satellite signal lock? (seconds)	60	< 15 seconds typical	< 15 seconds typical	< 15 seconds typical	< 15 seconds typical	< 15 seconds typical
For all available satellites? (seconds)		< 30 seconds typical	< 30 seconds typical	< 30 seconds typical	< 30 seconds typical	< 30 seconds typical
Can the system be preprogrammed or initialized with session observing criteria at an office before going to the sites?	Yes	Yes	N/A	N/A	N/A	N/A
If "Yes," can the system be programmed with information for multiple sessions?	Yes	Yes				
Size: (H" x W" x D")	6.8 x 6.3 x 3.5	8.5 x 3.9 x 3.0	8.5 x 3.9 x 3.0	5 x 6 x 6	4.4 x 2.0 x 7.7	4.4 x 2.0 x 7.7
Number of serial ports	2 (4 optional)	1 [16]	1 [16]	2	2	2
Material receiver is constructed of	Aluminum/plastic	XeNoy/magnesium	XeNoy/magnesium	XeNoy	Alloy	Alloy
Weight: (lbs.)	1.1	1.59	1.59	1.38	1.68	1.68
Is antenna included in the weight?	No	Yes	Yes	Yes	No	No
Weight: (lbs. Complete RTK rover-receiver, antenna, controller, radio, pole, batteries)	< 4	N/A		N/A	N/A	
ANTENNA						
Type:	Microstrip/Beacon	Integrated	Integrated	Combined L1/satellite DGPS	Combined L1/Beacon	Combined L1/Beacon/satellite DGF
Other?		Optional hurricane or patch antenna	Optional hurricane or patch antenna			
Is antenna built into the receiver?	No	Yes	Yes	Yes	No	No
If "Yes," is antenna removable?		No	No	N/A		
Weight, antenna (lbs.)	1.1	N/A	N/A	N/A	1.08	1.2
Length of antenna cable furnished with receiver?	1m	N/A	N/A	N/A	3 m	3 m
POSTPROCESSOR						
Is a system available for postprocessing data in the field?	Yes	Yes	Yes	Yes	Yes	Yes
U.S. SUGGESTED LIST PRICE (\$)		Contact dealer	Contact dealer	Contact dealer	Contact dealer	Contact dealer
Receiver?		Contact dealer	Contact dealer	Contact dealer	Contact dealer	Contact dealer
Antenna?		Contact dealer	Contact dealer	Contact dealer	Contact dealer	Contact dealer
Postprocessing hardware and software?		Contact dealer	Contact dealer	Contact dealer	Contact dealer	Contact dealer
Postprocessing software (only)?		Contact dealer	Contact dealer	Contact dealer	Contact dealer	Contact dealer
WARRANTY(months)						
Receiver?	12	12	12	12	12	12
Antenna?	12	12	12	12	12	12
Postprocessing hardware?	z	N/A	N/A	N/A	N/A	N/A
ADVANCED FEATURES	[14]					
READER SERVICE NUMBER	51	52	53	54	55	56

POB 2004 GPS Post-processing Software Survey

Product Name	TurboSurvey Software 2	SKI Pro Version 3.0	LEICA GEO Office	SPIDER	Spectrum Survey	STAR*NET-PRO V6	Ashtech Solutions
Manufacturer/Distributor	Allen Osborne Assoc. Inc.	Leica Geosystems	Leica Geosystems	Leica Geosystems	SOKKIA	Starplus Software Inc.	Thales Navigation
Manufacturer's phone number	805/495-8420	800/367-9453	800/367-9453	800/367-9453	800/255-3913	800/446-7848	408/615-5100
Technical Support policy	Free support	Leica Advantage Support [5]	Free basic level support	Leica Advantage	Free support	Free phone/E-mail support	Free with product registration
Are Multi-License discounts available?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can individual modules be purchased separately?	Yes	Yes	Yes	Yes	Yes	N/A	Yes
Are all features below supported in a single software package or are multiple packages required to achieve this? (# of packages required)	Yes	1	Single	No, 3	Product suite provided	Single	
OPERATING SYSTEMS							
Windows systems (specify)	Win 9X/NT/2000/XP	Win 95/98/NT/2000/XP	Win 98/2000/XP	Win 2000/XP professional	Win 9X/NT/2000/Me/XP	Win 95/98/NT/2000/XP	Win 95/98/NT/XP/2000
Other (specify)				None			
DATA INPUT							
Proprietary GPS data formats read (specify)	[1]	Leica	Leica		SOKKIA, Ashtech, Trimble	Most baseline formats	Ashtech
Handle RINEX files?	Yes	Yes	Yes	Generates and archives	Yes		Yes
Edit capability (antenna info, station names, etc.)	Yes	Yes	Yes	Yes	Yes	Imported to text files	Yes
Maximum number of input files	[2]	N/A	Unlimited	PC hard drive size	Unlimited	No limit	Unlimited
Maximum number of points or occupations	[2]	N/A	Unlimited	PC hard drive size	Unlimited	10,000 stations currently	Unlimited
Proprietary Optical Total Station and level raw observation formats read (specify)	N/A	Leica	Leica	RINEX, LB2, OWI, MDB, CMR	No	[10]	No
Import and display of background DXF maps and aerial orthophotos?	N/A	No	No	N/A	No	N/A	No
Import of National Geodetic Survey (NGS) data sheets in digital form?	N/A	No	No	Yes	No	G-Files and geoid files	No
PREPARATION OF PROCESSING NETWORK							
Presurvey planning?	Yes	Yes	Yes		Yes	N/A	Yes
Automatic arrangement of baselines?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Auto arrangement of independent baselines only?	Yes	Yes	Yes	Via scripting to Ski Pro	No		Yes
User editing of occupation info after file loading?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Manual solutions?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Automatic Internet download of CORS data?	Yes	Yes	Yes	Via scripting to Ski Pro	No		No
BASELINE PROCESSING							
GLONASS processing available?	Yes	No	No	No	No	N/A	Yes
Can precise ephemeris data, when available, be input?	Yes	Yes	Yes	Yes	Yes		Yes
Handle kinematic data or mixed with static?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Initialize kinematic on-the-fly?	Yes	Yes	Yes		Yes		Yes
Provide multiple solution types (triple difference, widelane) Specify.	[3]	Yes	[7]	Via scripting to Ski Pro	Yes		No
Results displayed in graphic form?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Statistical quality factors available?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Closure routines?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes		Yes
Ability to configure quality control indicators?	Yes	Yes	Yes	Yes	Yes		Yes
Will software process data from other manufacturers' receivers?	Yes	Yes, via RINEX	Yes, via RINEX	No	Yes		No
COORDINATE TRANSFORMATION							
State Plane Coordinates?	Yes	Yes	Yes	N/A	Yes	Yes	Yes
UTM Coordinates?	Yes	Yes	Yes	N/A	Yes	Yes	Yes
User-definable datum and coordinate system?	Yes	Yes	Yes		Yes	Yes	Yes
Grid and ground coordinate system support?	Yes	Yes	Yes		Yes	Yes	Yes
LEAST-SQUARES ADJUSTMENT							
Available with processing package?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes	Yes [11]	Yes
If integrated, automatic geoid modeling?	Yes	No	Yes	Via scripting to Ski Pro	Yes	Yes	Yes
Results displayed in graphic form?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes	Yes	Yes
Can adjust GPS, level and optical data together?	N/A	Yes	Yes	Via scripting to Ski Pro	No	Yes	No
Able to define different weighting groups for different data types?	N/A	Yes	Yes	Via scripting to Ski Pro	No	Yes	No
DATA EXPORT							
DXF output available?	Yes	Yes	Yes		No	Yes	No
Output RINEX files?	Yes	Yes	Yes	Yes	Yes	N/A	Yes
Formattable output files?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes	Yes	Yes
Export of National Geodetic Survey (NGS) Blue Book format report files?	Yes	Yes	Yes	Via scripting to Ski Pro	No		Yes
Export of reports in html format?	Consult developer	Yes	Yes	Via scripting to Ski Pro	No	N/A	Yes
Export to proprietary design, CAD, survey and GIS formats? (specify)	Consult developer	Yes, Microstations, AutoCAD, MapInfo	DXF, DWG, MapInfo	Via scripting to Ski Pro	Yes		
GENERAL							
Integrated backup/restore?	N/A	Yes	Yes	Yes	No		No
Integrated feature code processing, linework generation and CAD editing?	N/A	Yes, code processing	Yes	N/A	No		No
Integrated contouring and DTM generation?	N/A	No	No	N/A	No		No
Display as observations, features or both?	Both	Yes	Yes	Via scripting to Ski Pro	Point names or features		Both
Automatic calc of combined scale factor?	Yes	Yes	Yes	Via scripting to Ski Pro	Yes	Yes	Yes
Hardware lock, key disk, or other copyright protection?	Hardlock key	Hardware lock	Hardware lock	Yes	Product activation key	Hardware lock	Hardware
Are all features above included as standard or are some sold as optional extras?	Standard	Options	Some components optional	Yes	Standard	[12]	Yes
ADVANCED FEATURES							
U.S. SUGGESTED LIST PRICE (\$)	\$5,500	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact SOKKIA	\$1,595	Call for current pricing
Are all software capabilities included in the price or are there additional upgrade modules?	Included	Contact Leica Geosystems	Contact Leica Geosystems	Included	Contact SOKKIA	[12]	Upgrades available
Are update packages available to purchaser? If Yes, at what price? (U.S. \$)	N/A	Contact Leica Geosystems	Contact Leica Geosystems	Contact Leica Geosystems	Contact SOKKIA	[13]	Call for current pricing
READER SERVICE NUMBER	57	58	59	60	61	62	63

Numbers in brackets refer to notes on page 49.

POB 2004 GPS Post-processing Software Survey

Product Name	GNSS Studio	MobileMapper Office	Pinnacle	Trimble Geomatics Office	Trimble Total Control 2.7	GPS Pathfinder Office	GrafNav/GrafNet	GrafNav Static
Manufacturer/Distributor	Thales Navigation	Thales Navigation	Topcon	Trimble	Trimble	Trimble	Waypoint Consulting Inc.	Waypoint Consulting Inc.
Manufacturer's phone number	408/615-5100	408/615-5100	800/443-4567	800/TRIMBLE	800/538-8000	800/TRIMBLE	403/720-3800	403/720-3800
Technical Support policy	Free with product registration	Free with product registration	Free	Contact Trimble dealer	[21]	Yes	[26]	[26]
Are Multi-license discounts available?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Can individual modules be purchased separately?	Yes	N/A	Yes	Yes	No	No	No	No
Are all features below supported in a single software package or are multiple packages required to achieve this? (# of packages required)	Single	Single	Single	Single package available	Single package available	All except fixed solutions	Single, 1	Single, 1
OPERATING SYSTEMS								
Windows systems (specify)	Win 95/98/NT/2000/XP	Win 9X/Me/NT/XP/2000	Win 95/98/Me/NT/2000/XP	Win 98/XP/Me/NT/2000	Win 98/XP/Me/NT/2000	Win 95/98/Me/NT/2000/XP	Win 95/98/Me/NT/2000/XP	Win 95/98/Me/NT/2000/XP
Other (specify)		N/A						
DATA INPUT								
Proprietary GPS data formats read (specify)	Thales Navigation/Ashtech	MobileMapper	TPS/RINEX	Yes [18]	Yes [22]	Yes, SSF	[27]	[27]
Handle RINEX files?	Yes	Yes	Yes	Yes	Yes	Yes (base only)	Yes	Yes
Edit capability (antenna info, station names, etc.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maximum number of input files	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	N/A	None	None
Maximum number of points or occupations	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	N/A	None	None
Proprietary Optical Total Station and level raw observation formats read (specify)	No	No	No	Yes [19]	N/A	N/A	No	No
Import and display of background DXF maps and aerial orthophotos?	Yes	Yes	Yes	Yes	N/A	Yes	Yes, DEM only	No
Import of National Geodetic Survey (NGS) data sheets in digital form?	No	No	Yes	Yes	Yes	No	No	No
PREPARATION OF PROCESSING NETWORK								
Presurvey planning?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Automatic arrangement of baselines?	Yes	No	Yes	Yes	No	N/A	Yes	Yes
Auto arrangement of independent baselines only?	Yes	No	No	Yes	Yes	N/A	Yes	Yes
User editing of occupation info after file loading?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manual solutions?	Yes	No	Yes	Yes	Yes	N/A	Yes	Yes
Automatic Internet download of CORS data?	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
BASELINE PROCESSING								
GLONASS processing available?	No	No	Yes	No	Yes	No	Yes	Yes
Can precise ephemeris data, when available, be input?	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Handle kinematic data or mixed with static?	Yes	Yes	Yes	Yes	Yes	Kinematic, but not RTK	Yes, kinematic or mixed	No
Initialize kinematic on-the-fly?	Yes	No RTK	Yes	Yes	Yes	N/A	Yes	No
Provide multiple solution types (triple difference, widelane) Specify.	No	No	Yes	Yes	Yes	Fixed, float, code	L1, L1L2, L3 Iono Free	L1, L1L2, L3 Iono Free
Results displayed in graphic form?	Yes	Yes	Yes	Yes	Yes [23]	No	Yes	Yes
Statistical quality factors available?	Yes	Yes	Yes	Yes	Yes	Yes	Yes, many	Yes
Closure routines?	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Ability to configure quality control indicators?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Will software process data from other manufacturers' receivers?	No	No	Yes	Yes	Yes	Yes, base files only	Yes	Yes
COORDINATE TRANSFORMATION								
State Plane Coordinates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UTM Coordinates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
User-definable datum and coordinate system?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grid and ground coordinate system support?	Yes	Yes	Yes	Yes	Yes	Yes	[28]	[28]
LEAST-SQUARES ADJUSTMENT								
Available with processing package?	Yes	No	Yes	Yes	Yes	No	Yes	Yes
If integrated, automatic geoid modeling?	Yes	N/A	Yes	Yes	Yes	No	Yes	Yes
Results displayed in graphic form?	Yes	N/A	Yes	Yes	Yes	No	Yes	Yes
Can adjust GPS, level and optical data together?	No	N/A	No	Yes	No	No	No	No
Able to define different weighting groups for different data types?	No	N/A	Yes	Yes	Yes	No	N/A	N/A
DATA EXPORT								
DXF output available?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Output RINEX files?	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Formattable output files?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Export of National Geodetic Survey (NGS) Blue Book format report files?	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Export of reports in html format?	Yes	CSV and TXT	Yes	Yes	Yes	No	No	No
Export to proprietary design, CAD, survey and GIS formats? (specify)	SHP, DXF, UDA	SHP, MIF, DXF, CSV	Yes	Yes	Yes, various ESRI	[24]	No	No
GENERAL								
Integrated backup/restore?	No	No	Yes	Manual backup	No	No	No	No
Integrated feature code processing, linework generation and CAD editing?	Yes	Feature code processing	No	Yes	No	Yes	No	No
Integrated contouring and DTM generation?	No	No	No	Yes	No	No	No	No
Display as observations, features or both?	Yes	Features	Observations	Yes	Yes	Both	Yes	Both
Automatic calc of combined scale factor?	Yes	No	Yes	Yes	No	No	Yes	Yes
Hardware lock, key disk, or other copyright protection?	[15]	No	Yes	Yes	Yes, dongle required	Activation code	Yes	Yes
Are all features above included as standard or are some sold as optional extras?	Option available	Standard	Standard	Yes	Standard	Standard	No	Kinematic extra
ADVANCED FEATURES								
U.S. SUGGESTED LIST PRICE (\$)	Call for best pricing	[16]	\$2,000 to \$8,000	Contact Trimble dealer	Contact Trimble dealer	Contact Trimble representative	\$5,500	\$3,000
Are all software capabilities included in the price or are there additional upgrade modules?	Upgrades available	Post-processing option at \$795	Yes	Contact Trimble dealer	Contact Trimble dealer	[25]	No	Yes, except kinematic processing
Are update packages available to purchaser? If yes, at what price? (U.S. \$)	Call for best pricing	[17]	Yes	Contact Trimble dealer	Contact Trimble dealer	Free	N/A	
READER SERVICE NUMBER	64	65	66	67	68	69	70	71

POB 2004 GPS Survey Notes

Geodetic Receivers

1. L1 C/A & L2, code and carrier.
2. The helical antenna design yields superior gain to typical patch antenna elements.
3. The Rascal System is designed for use on land, in vehicles and for hydrographic surveys.
4. 100% waterproof.
5. For > 30 ft, consult factory.
6. Contact Allen Osborne Assoc. Inc.
7. Compact Flash Card/USB or serial download.
8. 0 seconds approximately - 4 seconds re-acquisition.
9. 60 m or more (with appropriate amplifiers).
10. SmartTrack-patented. Discrete elliptical filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even to low satellites and in adverse conditions. Interference resistant. Multipath mitigation.
11. L1 Phase, L1 C/A, L2 Phase, L2 P-Code. Fully independent L1 and L2 Code and Phase Measurements.
12. 30 seconds approximately - 4 seconds re-acquisition.
13. Varies depending on radio solution.
14. 255 ft without line amplifier.
15. SmartCheck: Reliability of OTF initialization better than 99.99%. Solution is continually checked in background to ensure 99.99% reliability. Typical OTF initialization to 30 km with 99.99% reliability. SmartTrack-patented. Discrete elliptical filters. Fast acquisition. Strong signal. Low noise. Excellent tracking, even to low satellites and in adverse conditions. Interference resistant. Multipath mitigation.
16. 0.3 cm + 0.5 ppm (choking antenna).
17. No full wave independent L1, L2.
18. L1 Full Wave Phase, L1 C/A code, L2 Full Wave Phase.
19. System can broadcast RTCM on two ports simultaneously, 4 data and power ports, 10E-6 TCXO, secure one directional port, CDMA wireless modem-ready. RingBuffer memory technology. Cleartrak technology. Extremely low noise independent tracking loops, 1cm L1, 1.5 cm L2.
20. Fully Independent L1 Code and Phase Measurements.
21. With AT501 antenna.
22. L1 C/A, L1 Phase, Precision Code.
23. Optional internal or removable PCMCIA Flash Memory.
24. Serial port/removable PCMCIA card.
25. 8 MB or 16 MB internal, up to 96 MB on removable PCMCIA card.
26. Uses industry standard camcorder batteries; no cable required.
27. Cable length depends on configuration: fixed, reference station, real-time pole or MiniPack.
28. Longer cables can be used with in-line amp.
29. With AT502 antenna.
30. L1 Full Wave Phase, L1 C/A, Precision Code, L2 Full Wave Phase, L2 P-Code (see Advanced Features).
31. System 500 will resolve ambiguities on the fly twice, perform a statistical analysis, compute the coordinates of the rover in relation to the reference and maintain reliability in excess of 99.99%. Each initialization is the result of two independent on-the-fly ambiguity solutions. As soon as the initialization is complete, the integrity monitoring continues in the background computing new, fully independent ambiguity resolutions every few seconds to check the displayed coordinates. Patented tracking technology, producing full wavelength L2 carrier with 13dB gain over cross correlation techniques alone. ClearTrak anti-jamming, narrow code and multipath mitigation. L1 Full Wave Length Carrier Phase, L1 C/A Narrow Code, Precision Code / L2 Full Wave Length Carrier Phase, L2 P-Code or P-Code aided under AS.
32. Via NavCom S/W on PC.
33. Via user selected PC/PDA & S/W.
34. L1 Phase, P1, L2 Phase, P2, C/A, C/No, WAAS.
35. User selectable; overall weight and power consumption will vary.
36. Depends on cable type & connector. Total signal loss must not exceed 10dB at 1.5GHz.
37. Optional extras include CAN bus interface, 1PPS output and Event in ports.
38. L1 Phase, P1, L2 Phase, P2, C/A, C/No, WAAS, StarFire 1PPS (optional).
39. NavCom StarFire corrections received through the integral tri-band antenna provide real-time decimeter positioning accuracy without the requirement for a separate base station and with near global coverage. Requires service subscription.
40. Depends on cable type & connector. Total signal loss must not exceed 10dB at 1.5GHz.
41. Semi-independent L1 and L2 code and phase measurements.
42. WAAS/EGNOS, OmniStar VBS/HP.
43. External or internal OmniStar HP.
44. KART - real-time kinematic processing with OTF init. for L1-only receiver, up to 12 km. LRK - Long Range Kinematic processing technology for fast, reliable, real-time centimeter-level positioning up to 40 km.
45. TCP/IP connectivity. Automatic FTP of collected data. Streams data through internet.
46. Up to 96 sessions can be programmed. MicroManager Pro software available for automatic download by modem. Full integration with Met and file sensors.
47. Removable memory, USB, Bluetooth, serial.
48. Patent-pending ADAPT-RTK technology. Patent-pending Vortex UHF antenna technology. Internal UHF + cellular.
49. L1 C/A, L1 Carrier, P-code, L2 Carrier.
50. H: 0.3 cm + 0.5 ppm x D // V: 0.5 cm + 0.5 ppm x D.
51. H: 0.3 cm + 1 ppm x D // V: 0.5 cm + 1.5 ppm x D.
52. H: 3 mm + 0.5 ppm x D // V: 5 mm + 0.5 ppm x D.
53. H: 1 cm + 1 ppm x D // V: 1.5 cm + 1 ppm x D.
54. H: 1 cm + 1.5 ppm x D // V: 1.5 cm + 1.5 ppm x D.
55. H: 1 cm + 1 ppm x D // V: 1.5 cm + 1 ppm x D.
56. L1-C1-P1-D1-L2-P2-D2 GPS/GLONASS.
57. With external beacon receiver.
58. With external DGPS receiver.
59. Receivers upgradeable via Internet or E-mail. Advance optional features include: Co-Op tracking, Advance Multipath Reduction. Internal camcorder batteries.
60. Receivers upgradeable via internet or E-mail. Advance optional fea-

- tures include: Co-Op tracking, advance multipath reduction. Onboard display.
61. Receivers upgradeable via internet or e-mail. Advance optional features include: Co-Op tracking, Advance Multipath Reduction. Bluetooth technology. Completely wireless receiver. Center mounted RF antenna technology.
 62. Receivers upgradeable via internet or E-mail. Advance optional features include: Co-Op tracking, advance multipath reduction. Bluetooth technology. Completely wireless system (base & rover). Center mounted Sp5p antenna technology.
 63. Totally integrated, cable-free RTK base and rover system. Bluetooth technology for controller communications. Internal UHF radio for transmit and receive of RTK corrections. Upgradeable via internet or E-mail. Advanced options include Co-Op tracking, advance multipath reduction.
 64. Receiver options and upgrades performed via software activation codes.
 65. Receivers upgradeable via internet or E-mail. Integrated controller. Advance optional features include: Co-Op tracking, advance multipath reduction, in-band interference rejection.
 66. PG-A1/PG-A2/Legant/Legant-3 (zero centered).
 67. Receivers upgradeable via internet or E-mail. Advance optional features include: Co-Op tracking, Advance Multipath Reduction, in-band interference rejection.
 68. L1 C/A code L1 full cycle carrier, fully operational during encryption.
 69. Measurement rates user configurable: 1 Hz, 2 sec, 5 sec, 10 sec, 15 sec, 30 sec, 60 sec, 5 min, 10 min.
 70. Available with attached data collector.
 71. Grid, local and ground coordinates available with attached data collector.
 72. In RINEX notation GPS L1, C1, P1, D1.
 73. Data transfer to/from the receiver: Serial Ports (2xRS232).
 74. WAAS/EGNOS.
 75. 2 internal radio receivers, e.g. UHF and HF/MF.
 76. Measurements rates user configurable: 10 Hz, 5 Hz, 2 Hz, 1 Hz, 2 sec, 5 sec, 10 sec, 15 sec, 20 sec, 60 sec.
 77. Using 1MB CF card > 64 hours @ 55Vs storing at 15sec intervals L1/L2.
 78. Receiver dimension: 11.8 cm H x 22.1 cm W (4.64" H x 8.7" W).
 79. Receiver only PP (with batteries) 1.70kgs (3.7lbs).
 80. 100% condensing, unit fully sealed.
 81. Tested to survive a 2 m (6.7 ft) drop onto concrete.
 82. For the many advanced features refer to the Trimble website at www.trimble.com
 83. In RINEX notation GPS L1, C1, P1, D1, L2, P2, D2 *Doppler on L2 can be constructed from the raw data.
 84. Data transfer to/from the receiver with Compact Flashcard in place: Serial Ports (2xRS232), USB Port, removable Compact Flashcard
 85. Limited only by Compact Flashcard technology. Using 64MB CF card > 1700hours @ 65Vs storing at 15 sec intervals L1/L2; using 128MB CF card > 3400hours @ 65Vs storing at 15sec intervals L1/L2.
 86. Receiver dimension: 8.5cm H x 13.5cm W x 24cm D (3.4 in H x 5.3 in W x 9.5 in D).
 87. Receiver only PP (with batteries) 1.20 kg (2.7 lbs) / Receiver only (with internal radio, batteries, UHF antenna included) 1.4 kg (3 lbs).
 88. Zephyr Geodetic 1.31 kg (2.88 lbs), Zephyr 0.55 kg (1.2 lbs), choke ring 4.55 kg (10 lbs).
 89. Total 4kgs (8.8lbs) as full RTK rover with 2 batteries, including internal battery charger and radio modem.
 90. 100% condensing, unit fully sealed.
 91. Shock MIL-STD-810 F to survive a 1 m (3.3 ft) drop onto concrete.
 92. In-line amplifier required for cable lengths greater than 30 m (100 ft).
 93. Measurements rates user configurable: 10 Hz, 5 Hz, 2 Hz, 1 Hz, 2 sec, 5 sec, 10 sec, 15 sec, 20 sec, 60 sec, 300 sec.
 94. Using 2 Mb internal memory > 55hours @ 65Vs storing at 15 sec intervals L1/L2.
 95. Receiver dimension: 10cm H x 19 cm W (3.9 in H x 7.5 in W).
 96. Receiver only PP (with battery) 1.21 kg (2.7 lbs) / Receiver only (with internal radio, batteries, UHF antenna included) 1.21 kg (2.7 lbs).
 97. Total 3.57 kg (7.87 lbs) as full RTK rover with battery, radio modem, range pole and data collector.
 98. Shock MIL-STD-810 F to survive a 2 m (6.6 ft) drop onto concrete.
 99. Data transfer to/from the receiver: Serial Ports (4xRS232), LAN Port (10BaseT/100BaseT).
 100. Unlimited using internet. Using Internal 150MB > 3400hours @ 75Vs storing at 15sec intervals L1/L2.
 101. Designed as geodetic reference station. RTK and DGPS support using Trimble GPS base or Trimble GPSNet software.
 102. Receiver dimension: 6.5 cm H x 22.8 cm W x 14 cm D (2.6 in H x 9 in W x 5.5 in D).
 103. Receiver only 1.6 kg (3.5 lbs).
 104. Zephyr Geodetic 1.31 kg (2.88 lbs), Zephyr 0.55 kg (1.2 lbs), choke ring 4.55 kg (10 lbs).
 105. 100% non-condensing; unit fully sealed from dust, sand and moisture.
 106. < 3.0 watts for NetRS, 3.5 watts with Dorne & Margolin choke ring antenna and 4 watts with a Zephyr Geodetic antenna.
 107. Using 6 Mb internal memory > 330hours @ 65Vs storing at 15 sec intervals L1/L2.
 108. Depends on configuration. Tripod/MiniPack/Pole: typical 2.8 m.

Mapping/Positioning Receivers

1. GS5+ is an all-in-one GPS receiver, antenna and beacon receiver unit. NMEA output.
2. GS5+ is available bundled as a backpack system with the Panasonic Toughbook01 data collector and ESRI's ArcPad software.
3. Options for RTCM correction input.
4. GS20 Professional Data Mapper: combines the power of a professional GIS system collecting GIS data, with the convenience of a handheld system.
5. On-board GIS data collection interface. Bluetooth wireless communication. Wireless real-time correction system accessories (the WoRCS). Real-time coordinate quality indicator. MaxTrak & Hypertrak for Robust GPS reception. GIS DataPRO software.
6. Via user selected PC/PDA & S/W.

7. User selectable; overall weight and power consumption will vary.
8. NavCom StarFire corrections received through the integral tri-band antenna provide real time decimeter positioning accuracy without the requirement for a separate base station and with near global coverage. Requires service subscription.
9. Optional extras include CAN bus interface, 1PPS output and Event in ports.
10. With PP-DGPS option.
11. Handheld DGPS/GIS data logging system; ruggedized; submersible; submeter accuracy in post-processing; full GIS attribution; office software for GIS support; grid mapping utility.
12. Ready for mobile applications, MobileMapper CE is the next generation handheld GPS mapping device from Thales. The cable-free MobileMapper CE system integrates submeter positioning with embedded Windows CE .NET, Bluetooth wireless technology and many more valuable features to offer field professionals the ultimate combination of high-performance and affordability. Designed for extreme outdoor and industrial environments. Field replaceable all-day battery.
13. This receiver is built as a sleeve to be used with Ipaq PDA.
14. Integrated Bluetooth wireless communications and Omnistar capable. Upgradeable via E-mail and internet with activation codes.
15. Using Beacon on a Belt (BoB).
16. Additional Bluetooth ports available.

GPS Post-processing Software

1. Allen Osborne, Ashtech, Javad, Leica, Novatel, Trimble.
2. Limited only by computer memory.
3. Yes, L1, L1L2, L3 (Iono Free).
4. Data from CORS and other permanent tracking receiver stations can be downloaded and manipulated to the specifications and requirements of the user's GPS processing needs.
5. Leica Advantage Support: Bronze, Silver and Gold Levels available. Bronze Level (free): basic access to LeicaAdvantage.com, basic telephone support, basic E-mail support, basic E-training, notification of upgrades and updates. Silver Level (contact Leica for pricing): all of Bronze Level support plus priority toll-free telephone support, priority E-training, software and firmware downloads, priority E-mail support, automatic upgrades and updates. Gold Level (contact Leica for pricing): all of Silver Level support plus free seat in Leica Geosystems training courses and reduced rates for Leica Geosystems training.
6. The continuous ambiguity checking of CheckMate technology on board the System 500 sensor is duplicated in the post processing software. Immediately after having completed the ambiguity search routine and having computed the most likely ambiguities with one set of GPS observations, SKI-Pro repeats the whole ambiguity search routine using a different set of GPS observations. This results in a second set of ambiguities. The ambiguities computed in this second search routine are then compared with the ambiguities computed in the first ambiguity search. If the two sets of ambiguities are identical, then the ambiguities are considered to be correct. In order to ensure the highest possible reliability, the ambiguity search routine is continually repeated for the entire observation interval.
7. L1, L2, L1+L2, Iono Free (L3)
8. Easy, fast and comprehensive automated suite of programs for TPS, GPS and Level data. View and manage TPS, GPS and Level data in an integrated way. Process independently or combine data—including post-processing and support of real-time GPS measurements. Manage all data in an integrated manner. Project management, data transfer, import/export, processing, viewing data, editing data, adjustment, coordinate systems, transformations, code lists, reporting etc. Consistent operating concepts for handling GPS, TPS and level data based on Windows standards.
9. Spider is a new, advanced, affordable internet/dial-up GPS Reference Station Software program with full internet connectivity for controlling, operating, and managing reference stations. Spider is a PC service-based operation. It controls, configures, downloads automatically with warning messages, monitors systems, distributes data and configures RTK (RTCM, CMR, Leica). Advance GPS product generation (RINEX, compressed, zipped, FTP), 24/7 fully automated.
10. All static and RTK vector imports are built-in.
11. STAR*NET-PRO is a stand-alone least squares network adjustment package that handles GPS vectors, conventional and leveling. Additional editions STAR*NET and STAR*NET-PLUS (\$795 and \$995) handle conventional observations and differential leveling but without GPS support.
12. Individual utilities for converting data collector formats (TDS, Carlson, SDR, SMI, Geodimeter, Trimble TSCe, etc.) and digital level formats (Leica, Zeiss/Trimble, Topcon, etc.) are available as separate modules \$145 to \$195.
13. \$695 upgrade from previous STAR*NET-GPS VS D05-based package.
14. Instrument Library feature for creating weighting scenarios used in combining multiple instrument networks (e.g. combining old surveys with new). Built-in checker for ASCM/ALTA positional tolerance specification conformance. Special "Map Mode" feature for combining record map data in with geodetic networks. Ground File coordinates generator within the geodetic network adjustment.
15. HW and SW protection available.
16. \$1,595 hardware + software - MobileMapper System.
17. Free of charge with product registration.
18. Supports Trimble field formats: DAT, DC, TOO, T01, NavCom database, TDS formats.
19. Supports Trimble, TDS, Nikon, SDMS, Topcon, Leica, Sokkia, Autodesk file formats.
20. See advanced features at www.trimble.com.
21. Unlimited free technical support; also, technical support is available by a subscription.
22. Supports Trimble file formats, DAT, DC, TOO, GPSurvey database, TDS formats.
23. Supports differencing equation results on L1, L2, narrow and wide larian frequency types.
24. ArcView Shapefile, MapInfo MIF, Microsoft Access MDB, dBASE, AutoCAD DXF, MicroStation DGN, ASCII.
25. Centimeter processor for fixed solutions.
26. 1 year free support and upgrades after purchase
27. AOA (all models), Ashtech (b-file, DSNP and real-time), CMC (all models), Connexant (Jupiter/NAVCOR), CSI DGPS-MAX, Javad/Topcon (all models), Leica (SR, IX, System 500), Motorola, NavCom (all models), NovAtel (all models), RINEX, Septentrio, Sirf Binary, Trimble (DAT, Real-time, TIPP, TSIP).
28. Transverse Mercator and Lambert Conformal
29. Windows and WinCE datalogger, advanced kinematic processing, automatic detection of receiver format, and multiple base station batch processor.