A Tokyo University of Marine Science and Technology

Skytraq Manual (Single frequency receiver) Procedure to logging skytraq data with RTKNAVI

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Skytraq Receiver

Slavi				11/122	
empower mobility, wit	hout uncertainty				
About us	News	Product	s	Careers	Contact
					Home > PRODUCTS
Introduction	Products for G	S and GNSS	roduct Selector		
GPS Chipset	SkyTraq develop	s GPS/GNSS chipse	t/module solutions	for meter-level a	ccuracy positioning to
GPS Module	machine control	, and aerial surv	ey applications.	skyTraq's industr	v leading GPS/GNSS
RTK Module	technology delive attenuated indoo	ers state of the art r and difficult urban	Canyon environm	ce, and reliable na ents.	wigation under signal
DR Module	SkyTrag provides	s solutions to enat	ole rapid system	integration. We of	fer evaluation board.
Timing Module	reference design,	and technical docu	ment to facilitate o	customer adopting	our products.
			SkyT@ SSSSER.RTK lot.M1534R01	BWT (S) (S17208) BWT (S) (S17208)	

http://www.skytraq.com.tw/products/products.html



S1216F8-BD-RAW ✓ Datasheet

Features

- 167 Acquisition/Tracking Channels
- Support QZSS, WAAS, MSAS, EGNOS, GAGAN
- 16 million time-frequency hypothesis testing per sec
- -148dBm cold start sensitivity
- -165dBm tracking sensitivity
- 29 second cold start TTFF
- 3.5 second TTFF with AGPS
- 1 second hot start
- 2.5m CEP accuracy
- Multipath detection and suppression
- Jamming detection and mitigation
- 7-day extended ephemeris AGPS
- Contains LNA, SAW Filter, TCXO, RTC Xtal, Regulator
- Works with active and passive antenna
- On board active antenna short protection
- On board active antenna detection
- Complete receiver in 12.2mm x 16.0mm size
- Operating temperature -40 ~ +85°C
- Pb-free RoHS compliant

Applications

- Navigation and asset tracking
- Timing reference

S1216

High-Performance Low-Cost 167 Channel SMD Global Positioning Receiver Module

The S1216 family is state-of-the-art global navigation satellite system receivers capable of using GPS, GPS/Beidou, or GPS/GLONASS signal under the same footprint. User can upgrade from GPS navigation system to GPS/Beidou or GPS/GLONASS dual-satellite navigation systems by choosing appropriate model type without hardware redesign.

The –BD12 and –GL12 entry level models offer dual-satellite navigation capability, tracking up to 12 GPS/Beidou or 12 GPS/GLONASS signals combined respectively. Its NMEA output is the same format as GPS receivers, thus users can effortlessly upgrade GPS product to GPS/Beidou or GPS/GLONASS product without needing modification on the application software.

The -BD and -GL standard models tracks up to 24 GPS/Beidou or 24 GPS/GLONASS satellite signals combined respectively.

Dual-satellite navigation receiver module receives greater number of satellites than available for GPS-only receivers. The increased satellite number offers superior performance in challenging urban canyon and multipath environments.

The S1216 module contains SkyTraq Venus 8 positioning engine inside, featuring high sensitivity for indoor fix, low power consumption, and fast TTFF. The superior -148dBm cold start sensitivity allows it to acquire, track, and get position fix autonomously in difficult weak signal environment. The receiver's -165dBm tracking sensitivity allows continuous position coverage in nearly all application environments. The high performance signal parameter search engine is capable of testing 16 million time-frequency hypotheses per second, offering industry-leading signal acquisition and TTFF speed.

The S1216 module contains LNA for easy integration with passive antenna and a SAW filter for increased jamming immunity. It works with both passive and active antenna; the self-contained antenna detection and short circuit protection feature enables lowest integration cost for

http://www.skytraq.com.tw/datasheet/S1216V8_v0.9.pdf

Skytraq Receiver



Objective



- 1. Connection step
- 2. Checking the observation data by RTKNAVI(RKTLIB)
- 3. Logging data by RTKNAVI(RTKNAVI)
- ✓ Procedure to RTK-GNSS by two Skytraq receivers
 - 2 Post process
 - **3** Real-time process using Ntrip caster

Post process by RTKPOST



Real-time process using Ntrip caster



Post process by RTKPOST



Procedure to logging Skytraq data 1.Connection step



1 Procedure to logging Skytraq data 1.Connection step



1 Procedure to logging Skytraq data 1.Connection step

RTKLIB v.2.4.2

(1)Input stream setting



Select Port No. by device manager

	Serial Option	s				\times
	Port	COM6	~	Parity	None	\sim
,	Bitrate (bps)	115200	\sim	Stop Bits	1 bit	\sim
	Byte Size	8 bits	\sim	Flow Control	None	\sim
				<u>O</u> K	<u>C</u> ancel	

1 Procedure to logging Skytraq data 1.Connection step



(1)Input stream setting

Green light is blinking (success to connect)



Start to connect

Procedure to logging Skytraq data Checking the observation data



②RTKNAVI options

First stop connection to change the options to do the Single point positioning

		<u> </u>	Chang	<u>ge the</u>	0	ptio	ns			_
Ор	tions					•			×	
S	etting <u>1</u>	Setting2	O <u>u</u> tput	Statistics	Po	ositions	Files	Misc		
	Positio	oning Mode				Single			\sim	
	Frequ	encies / Fil	ter Type			L1+L2		Forward	\sim	
	Elevat	tion Mask (°) / SNR M	lask (dbHz)		15	~			
	Rec D	ynamics / E	Earth Tide	s Correction	n	OFF	\sim	OFF	\sim	
	Ionos	phere Corr	ection			Broadca	ast		\sim	
	Tropo	sphere Co	rrection			Saastar	noiner	ı	\sim	
	Satelli	te Epheme	ris/Clock			Broadca	ast		\sim	
	Sa	t PCV 🗌 F	Rec PCV	Ph-Wind	up	Rejec	t Ed		FDE	
	Exclud	ded Satellit	es (+PRN	: Included)						
	✓ GP	s 🖂 GLO	🖂 Galil	eo 🗹 QZS	s (SBAS	⊿в	eiDou		
			<u>L</u> oad	<u>S</u> ave			<u>0</u> K	<u>C</u> an	cel	

RTKNAVI execute the real-time single point positioning and solution

Start connection

RTKNAVI ver.2.4.2	
2017/01/30 10:39:18.0 GPST	
🖽 Lat/Lon/Height 🝷	Rover:Base SNR (dBHz) -
Solution: SINGLE N: 35° 39' 58.8163" E: 139° 47' 31 8814"	
L: 137 47 51.0014	50
N: 1.523 E:529 U: 3.498 m Age: 0.0 s (atio: 0.0 # Sat:17	40
Star Stop Pla	ot Cotions Exit

- Check the strength of SNR Strong one around the 50dBHz is enough to do RTK
- If these bars are still gray for over few minutes, receiver do not stream the navigation data(Ephemeris)

①Procedure to logging Skytraq data

2. Checking the observation data

RTKLIB v.2.4.2							
🐺 🖻 📲 🎇 🖬 🐯 🐯							
		rt ohs	data				
RTKNAVI ver.2.4.2			uutu				
Rover:Base SNR (dBHz)	🔤 🐺 RTKNAVI ver.2.4.2: R	TK Monito	or				
Solution: SINGLE	Obs Data 🗸 Normal	\sim					
N: 35° 39' 58.8163"	Trcv (GPST)	SAT RC	/ P1 (m)	P2 (m)	P5 (m)	L1 (cycle)	L2 (cyd
E. 139º 47' 31 8814" 149946 13876 10108460	2017/01/30 10:38:57.997	G04 1	20387391.683	0.000	0.000	642430.017	0.000
	2017/01/30 10:38:57.997	G08 1	24751047.667	0.000	0.000	-677601.329	0.000
He: 57.819 m	2017/01/30 10:38:57.997	G09 1	24613971.330	0.000	0.000	-1783764.335	0.000
N: 1.523 E: 1.529 U: 3.498 m	2017/01/30 10:38:57.997	G14 1	23104735.541	0.000	0.000	2957378.778	0.000
	2017/01/30 10:38:57.997	G16 1	20446458.886	0.000	0.000	-1262329.692	0.000
	2017/01/30 10:38:57.997	G21 1	22588886.945	0.000	0.000	-1231811.356	0.000
	2017/01/30 10:38:57.997	G23 1	22348318.588	0.000	0.000	-1639446.735	0.000
Start Stop Plot Options	2017/01/30 10:38:57.997	G26 1	20313997.834	0.000	0.000	-131866.455	0.000
Chack datails of the	2017/01/30 10:38:57.997	G27 1	21288894.262	0.000	0.000	-3169847.438	0.000
Check details of the	2017/01/30 10:38:57.997	G29 1	23385406.196	0.000	0.000	2826637.696	0.000
stream data	2017/01/30 10:38:57.997	G31 1	20649777.018	0.000	0.000	1059991.467	0.000
	2017/01/30 10:38:57.997	JO1 1	37523272.713	0.000	0.000	-66217.846	0.000
	2017/01/30 10:38:57.997	C01 1	36583737.919	0.000	0.000	-336007.043	0.000
	2017/01/30 10:38:57.997	C02 1	39281322.281	0.000	0.000	-317065.139	0.000
	2017/01/30 10:38:57.997	C03 1	37481850.566	0.000	0.000	-342550.906	0.000
	2017/01/30 10:38:57.997	C04 1	37034063.299	0.000	0.000	-336328.257	0.000
	2017/01/30 10:38:57.997	C06 1	39888648.329	0.000	0.000	1437194.237	0.000
	2017/01/30 10:38:57.997	C07 1	35877181.814	0.000	0.000	-707796.520	0.000
	<						

①Procedure to logging Skytraq data

2. Checking the observation data



①Procedure to logging Skytraq data

3.Logging data by RTKNAVI(RTKNAVI)



Plot for results

Post process by RTKPOST



RTKPOST(RTKLIB)

⁽²⁾Procedure to RTK-GNSS Post process Post process RTK-GNSS by RTKPOST

RT

2

RTKLIB v.2.4.2	Both rover and base station data (zero-baseline) 1.5hours by 1Hz at the roof top of the building
RTKPOST ver.2.4.2	Coptions
Time Start (GPST) Time End (GPST) Interval □ 2017/01/30 ↓ 13:10:00 ↓ 2017/01/31 ↓ 13:10:00 ↓ 24	Options Nit H Setting1 Setting2 Output Stats Positions Eiles Misc
RINEX OBS: Rover ? (e) D:¥rawdata¥2017¥170201¥0203ref¥0203_0333_skytraq1.obs RINEX OBS: Base Station (e) D:¥rawdata¥2017¥170201¥0203rov¥0203_0333_skytraq2.obs (e) (e)	Rover Lat/Lon/Height (deg/m) v 90.00000000 0.000000000 -6335367.6285 Antenna Type (*: Auto) Delta-E/N/U (m) * v
RINEX *NAV/CLK, SP3, IONEX or SBS/EMS	■ Base Station ■ Lat/Lon/Height (deg/m) ■ 35.666515260 139.792395600 59.4068 ■
Solution Dir	
processing : 2017/02/03 03:35:53 Q=1	?
Plot Uiew To KML Options Abort	t
Setting options	Options Options Setting1 Setting2 Output Stats Positioning Mode Kinematic Integer Ambiguity Resting1 Setting1 Setting2 Output Stats Positions Eles Misc Positioning Mode Kinematic Integer Ambiguity Res (GPS/GLO/BDS) Insta ON ON

⁽²⁾Procedure to RTK-GNSS Post process

Post process RTK-GNSS by RTKPOST



Real-time process using Ntrip caster

③Procedure to RTK-GNSS Real-time process Base station setting (STRSVR)

x Serial Options COM56 Port Ŧ Parity None Bitrate (bps) 115200 Stop Bits 1 bit Ŧ 8 bits Byte Size Flow Control None OK Cancel x NTRIP Server Options NTRIP Caster Host Port 153.121.59.53 2101 Password Mountpoint User-ID ECJ12 * String Ntrip.... <u>O</u>K Cancel Ntrip Browser ver.2.4.2 File Edit View Help 3 153, 121, 59, 53; **+ ↓** STR CAS NET SRC MAP Mountpoint ID Format Format-Details ECJ07 Kaiyodai Etchujima RTCM 3.2 1019(15), 1077(1), 1107(1), 1117(1), 1127(1) ECJ22 Kaiyodai Etchujima RAW BINEX ECJ27 Kaiyodai Etchujima RTCM 3.2 1004(1), 1012(1), 1019(60), 1020(60) KOJ22 Keiodai Hivoshi RAW BINEX KOJ27 Keiodai Hivoshi RTCM 3.2 1004(1), 1012(1), 1019(60), 1020(60) BOJ12 Boeidai Miura RAW NovAtel OEM6 Raw KMB22 UTokvo Komaba RAW BINEX

UTokyo Komaba

KMB27

- O X

Car Nav-Syste Network

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RTCM 3.2 1074(1),1084(1),1094(1),1114(1),1124(1),1019 2 GPS+GLO GSPASE

GPS+BDS GSPASE

GPS+GLO_GSPASE

GPS+GLO_GSPASE

GPS+GLO_GSPASE

GPS+GLO_GSPASE

GPS+GLO_GSPASE

GPS+GLO GSPASE

Start to stream

STRSVR ver.2.	4.2			
2017/02/03 0	5:19:42 GPST	Connect [•]	Time: 0d	00:00:12
Stream	Туре	Opt Cmd	bytes	bps
🔳 (0) Input	Serial 🔻)	13,318	6,440
	[
 (1) Output 	NTRIP Server 🔻		13,318	11,964
(2) Output]	0	0
(3) Output			0	0
		-		
	(1) 153.12	1.59.53/ECJ12		:: ?
<u>S</u> tart	S <u>t</u> op	Optior	ıs][E <u>x</u> it

Real-time process using Ntrip caster

③Procedure to RTK-GNSS Real-time process Rover setting (RTKNAVI)

RTKLIB v.2.4.2	Input Streams
	Input Stream Type Opt Cmd Format Opt
	✓ (1) Rover Serial ▼ SkyTraq ▼…
	(3) Correction NTRIP Client VIII RTCM 3 VIII
	Transmit NMEA GPGGA to Base Station
RTRIVAVI Vel.2.4.2	OFF 0.000000000 0.00000000
2000/01/01 00:00:00.0 GPST I 400 → 0 → 0 0 0 × 0 0 · · ·	Input File Paths
E Lat/Lon/Height Rover:Base SNR (dBHz)	
Solution:	
	Time x1 + 0 s OK Cancel
E: 0° 00' 00.0000"	Output Streams
He: 0.000 m	Output Stream Type Option Format
N: 0.000 E: 0.000 U: 0.000 m	▼ (4) Solution 1 File ▼ Image: Comparison of the second s
Age: 0.0 s Ratio: 0.0 # Sat: 0	□ (5) Solution 2 Serial V ···· Lat/Lon/Height V
	Output File Paths
	C:¥Users¥lets-ax2¥Desktop¥170130¥%m%d_%h%M_rtk.pos
<u>Start</u> Stop Plot Options Exit	
	Log Streams
ۍ ۲	Log Stream Type Option
	G) Rover File √ …
	(7) Base Station File
	(8) Correction Serial VIII
	Log File Paths
	C:¥Users¥lets-ax2¥Desktop¥170130¥%m%d_%h%M_skytraq1.raw
	C:¥Users¥lets-ax2¥Desktop¥170130¥%m%d_%h%M_skytraq2.raw
	Time-Tag Swap Intv + H ? OK Cancel

③Procedure to RTK-GNSS Real-time process Rover setting (RTKNAVI)

RTKNAVI	ver.2.4.2				
2000/03	1/01 00:00:00.0 GPST	I		0	L
∷ Lat/Lor	n/Height 🔹	Ro	ver:Base SNR (dBHz)	•	•
Solution	n: 🗆				-50 -40
N:	0° 00' 00.0000"				-30
E:	0° 00' 00.0000"				
He:	0.000 m				-50
N: 0.00 Age: 0	00 E: 0.000 U: 0.000 m 0.0 s Ratio: 0.0 # Sat: 0				-40 -30 -20
	<u></u>				
			r	11	7
Start	Stop P	ot	Options	Options	
				Setting <u>1</u>	Settin

Setting options

ptions								x
Setting <u>1</u>	Setting2	Output	S <u>t</u> atistics	Po	sitions	Files	Misc	
Positio	oning Mode	Kinema	tic		•			
Frequ	encies / Fil	ter Type			L1		Forward	-
Elevat	tion Mask (°) / SNR N	1ask (dbHz)		15	•		
Rec D	ynamics / E	Earth Tide	s Correction	n	OFF		OFF	•
Ionos	phere Corr	ection			Broadc	ast		•
Tropo	sphere Cor	rrection			Saasta	moinen		-
Satelli	te Epheme	ris/Clock			Broadc	ast		-
Sa	t PCV 📃 F	Rec PCV [Ph-Wind	.jp [Reje	t Ed [RAIM	DE
Exclud	ded Satellit	es (+PRN	: Included)					
🗸 GP	s 📃 GLO	📃 Galil	eo 📃 QZS	s [SBAS	V Be	iDou	
		<u>L</u> oad	<u>S</u> ave			<u>0</u> K] <u>C</u> an	cel

Options						×
Setting1	Setting2	Output	Statistics	Positions	Files	Misc
Rover						
Lat/Lon/	Height (de	g/m) 👻				
90.0000	00000	0.00	0000000	-	6335367.6	285
Anten	na Type (*	: Auto)		Delta-E/N	√U (m)	
				0.0000	0.0000	0.0000
Base Sta	tion					
Lat/Lon/	Height (de	g/m) 🔻				
35.6665	1531	139	7923956	5	9.4068	
Anten	na Type (*	: Auto)		Delta-E/N	√U (m)	
				0.0000	0.0000	0.0000
Station Po	osition File					
						=
		Load] <u>S</u> ave		<u>о</u> к	<u>C</u> ancel

Options								X		
Setting	1 Setting2	O <u>u</u> tput	S <u>t</u> atistics	Po	sitions	Files	Misc]		
Int	Integer Ambiguity Res (GPS/GLO/BDS)									
Mir	Ratio to Fix	Ambiguity		[3.0					
Mir	Confidence /	Max FCB	to Fix Amb	[0.9999		0.20			
Mir	Lock / Elevat	ion (°) to	Fix Amb		0		0			
Mir	Fix / Elevatio	on (°) to H	iold Amb	[10		0			
Ou	tage to Reset	: Amb / Sli	p Thres (m)	[5		0.050			
Ma	k Age of Diff	(s) / Sync	Solution	[30.0		OFF	-		
Re	ect Threshold	l of GDOP	/Innov (m)	[30.0		30.0			
Nu	Number of Filter Iteration									
	Baseline Leng	th Constr	aint (m)	[0.000		0.000			
		<u>L</u> oad	<u>S</u> ave			<u>о</u> к	<u>C</u> ar	ncel		

③Procedure to RTK-GNSS Real-time process Rover setting (RTKNAVI)

Start!

③Procedure to RTK-GNSS Real-time process Show results (RTKPLOT)

Appendix Post process Single point positioning

RTKLIB v.2.4.2

2017/2/3 Base station data

2D plot

Time series of solution

Appendix Post process Single point positioning

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RTKLIB v.2.4.2

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2017/2/3 Rover data

Time series of solution

Setting1 Setting2 Output Stats Positions Files Misc

Sat PCV Rec PCV PhWindup Reject Ed RAIM FDE

GPS GLO Galileo QZSS SBAS BeiDou

Load... Save...

Single

L1

15

OFF

Broadcast

Broadcast

Saastamoinen

OK

Cance

- Forward

- OFF

Positioning Mode

Frequencies / Filter Type

Ionosphere Correction

Troposphere Correction

Satellite Ephemeris/Clock

2017/2/3

Elevation Mask (°) / SNR Mask (dBHz)

Rec Dynamics / Earth Tides Correction

Excluded Satellites (+PRN: Included)

Appendix Post process DGNSS

Options

Positioning Mode

Frequencies / Filter Type

Elevation Mask (°) / SNR Mask (dBHz)

Setting1 Setting2 Output Stats Positions Files Misc

DGPS/DGNSS

Forward

L1

15

Appendix Post process DGNSS UBLOX

Both rover and base station data (zero-baseline) 3hours by 1Hz at the roof top of the building 2016/6/10

