NS94XX Series High performance navigation signal simulator

Datasheet

Saluki Technology Inc.

The document applies to the GNSS constellation simulator of the following model:

- NS9440 High performance navigation signal simulator

- NS9450 High performance navigation signal simulator

- NS9460 High performance navigation signal simulator

Standard package and accessories:

No.	Item
1	Main Machine
2	User manual
3	Power cable
4	Bundled RF cable
5	IPC monitor

Optional functions

	Item
NS9400-01	Real-time closed-loop simulation components
NS9400-02	Evaluating software components
NS9400-03	Inertial navigation simulation components
NS9400-04	Interference Simulation Components
NS9400-05	Serial timing simulation component

Preface

Thank you for choosing NS94XX series satellite navigation signal simulator produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with "superior quality and considerate service", and are committed to offering satisfactory products and service for our clients.

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The warranty period of the product is 36 months from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Settings Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

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Content

1. Overview

Saluki NS94XX series of high-performance navigation signal simulators adopts an expandable hardware platform, open control protocols and communication protocols, which can meet the requirements of flexible architecture test systems. The device can be used in cascade with trajectory simulators, interference simulators and third-party signal sources, and has the ability to simulate and output multi-system, multi-carrier and multi-beam signals.

The device supports the global signal system of the Beidou satellite navigation system, provides satellite navigation signal simulation for the four major satellite navigation systems in the world, supports the signal simulation output of any combination of full-frequency points of constellations such as BDS/GPS/GLONASS/Galile0/QZSS/IRNSS, and has the ability to provide high-stability standard 1PPS pulse signals and 10MHz clock signal output.

The device has multi-beam output capability, each port supports 32-channel output, each channel supports the independent output capability of a single satellite signal, and the output satellite number is configurable; it supports multi-carrier signal simulation output, which can meet the application requirements of multi-aircraft formation flight navigation test and various multi-terminal collaborative navigation test.

1.1. Main functions:

(1) Constellation simulation:

It can complete satellite orbit simulation, satellite clock difference simulation, delay differential TGD simulation, etc. of BDS/GPS/GLONASS/Galile0/QZSS/IRNSS constellations;

It can simulate and generate satellite orbits, observation data and navigation messages of BDS constellation, GPS constellation, GLONASS constellation, Galileo constellation, QZSS constellation, IRNSS constellation and its enhanced constellation, and can simulate the changes of satellite signal strength during the movement of the carrier, etc.;

(2) Trajectory simulation:

It has the ability to generate static and dynamic trajectories, and can simulate the motion characteristics of static and dynamic carriers such as satellites (GEO/MEO/HEO/LEO), vehicles, ships, and aircraft, and simulate the user's motion trajectory; at the same time, it can simulate special motion trajectories such as circles and spirals. It has the function of simulating special scenarios, and can simulate and generate special scenarios with fixed pseudorange, fixed speed, and fixed acceleration;

(3) Environmental simulation:

It can simulate the influence of various error sources on navigation signals during atmospheric propagation, and can turn on and off the influence of error sources, including ionospheric delay, tropospheric delay and atmospheric parameters (temperature, humidity, air pressure, etc.), as well as the double atmospheric effect caused by the far-side satellite signal passing through the atmosphere twice;

(4) Abnormal simulation:

It can simulate various satellite navigation system failures, including signal lock/interruption, pseudorange or carrier and power abnormalities. Users can set satellite integrity parameters, including: satellite health word, URA, regional user range accuracy index (RURAI), etc. For special users, it supports ionospheric storm and ionospheric scintillation abnormal simulation;

(5) Simulation control:

It can configure simulation time, static carrier trajectory, dynamic carrier trajectory, special carrier trajectory and other parameters through the human-computer interaction interface, support external trajectory import, and specify external input trajectory files; it can set the pseudorange, power and other parameters of each channel, and can set the ionospheric delay and tropospheric delay. It has the function of recording and outputting observation data and navigation messages, and has the script editing ability of pseudorange and power jump gradient;

(6) Antenna modeling:

It has the function of modeling satellite antenna patterns and carrier antenna patterns, can set antenna patterns and antenna attitude parameters, and can receive external input antenna pattern data;

(7) System integration:

It uses a standard 4U AXI chassis, an expandable hardware platform, and open control and communication protocols to meet the requirements of a flexible architecture test system.

1.2. Option Description

(1) Real-time closed-loop simulation components: Real-time closed-loop simulation function, supporting real-time trajectory data injection of external trajectory simulator, with real-time performance reaching millisecond level;

(2) Evaluating software components: Functions such as real-time evaluation, process scripting, batch automated testing, and automatic report generation; can complete positioning accuracy, speed measurement accuracy, distance measurement accuracy, consistency testing, bit error rate and other tests;

(3) Inertial navigation simulation components: It can simulate gyro data and add-meter data according to the gyro and add-meter parameters set by the user, and can output synchronously with satellite signals. The output delay and rate are adjustable, and it supports the import of external inertial navigation data.

(4) Interference Simulation Components: It can complete the simulation of forwarding interference, deceptive interference, multipath interference and custom interference, and can generate custom interference signals such as continuous wave, swept frequency signal, and frequency modulation signal;

(5) Serial timing simulation component: It can complete the time synchronization function for user machines, the time synchronization time can be offset, and the number of time synchronization times can be set.

2. Specifications

2.1.1. Supported frequency

No.	Constellation	Frequency
1	BDS	B1I
2	BDS	B3I
3	BDS	B1C
4	BDS	B2a
5	BDS	B2b
6	BDS	Authorization signal
7	GPS	L1C/A
8	GPS	L1C
9	GPS	LIP
10	GPS	L2C
11	GPS	L2P
12	GPS	L5
13	GLONASS	L1OF
14	GLONASS	L2OF
15	GLONASS	L1OC
16	GLONASS	L3OC
17	Galileo	E1
18	Galileo	E5a
19	Galileo	E5b
20	QZSS	L1C/A
21	QZSS	L1C
22	QZSS	L2C
23	QZSS	L5
24	IRNSS	L5
25	SBAS	WASS
26	SBAS	EGNOS

27	SBAS	GAGAN
28	SBAS	MSAS
29	SBAS	BDSBAS
30	RDSS	S1
31	RDSS	S2C
32	RDSS	Authorization signal

2.1.2. Signal support

Model	NS9440	NS9450	NS9460
1	Supports all public navigation signals and Beidou authorized signals in the world	Supports up to 16 users/carriers/beams, supports all public navigation signals and Beidou authorized signals in the world,	Supports up to 64 single-satellite signals
2	Up to 32 channels per frequency point	Up to 32 channels per frequency point	Supports up to all public navigation signals and Beidou authorized signals in the world
3	up to 16 multipaths per frequency point	16~256 per frequency point	/

2.1.3. Signal Accuracy

No.	Parameters	Range
1	Pseudorange accuracy	Design ≤ 0.0003mm Actual measurement 0.01m
2	Pseudorange rate change accuracy	<0.001m/s
3	Channels consistency	0.1ns

2.1.4. Signal Dynamic range

No.	Parameters	Range
1	Speed	≥400000m/s
2	Acceleration	≥300000m/s^2
3	Jerk:	≥900000m/s^3

4	Simulation altitude	≥9000Km

2.1.5. Phase Noise

No.	Frequency Level	Noise Value
1	100Hz	-75dBc/Hz
2	1kHz	-80dBc/Hz
3	10kHz	-85dBc/Hz
4	100kHz	-90dBc/Hz

2.1.6. External Interface

No.	NS9440	NS9450	NS9460
1PPS/10MHz pulse signal input port	SMA:1 input, 1 output, 1 32pps output	SMA:1 input, 1 output, 1 32pps output	SMA:1 input, 1 output, 1 32pps output
1PPS/10MHz pulse signal output port	SMA: 1 input, 2 outputs	SMA: 1 input, 2 outputs	SMA: 1 input, 2 outputs
RF output port	SMA: 1 to 16	SMA: 1 to 16	SMA: 1 to 64

2.1.7. Optional

	Item
NS9400-01	Real-time closed-loop simulation components
NS9400-02	Evaluating software components
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NS9400-04	Interference Simulation Components
NS9400-05	Serial timing simulation component

2.2. Compliant

2.2.1. CE

- EMC

Complies with the requirements of the **EC EMC** directives.

Test Standards:EN 61326

- Safety

Complies with **EC LVD** Directive.

Test Standard:**EN61010-1**

2.2.2. ISO

- Manufacturing

This instrument is manufactured in an ISO-9001 registered facility

- End of Document -