

GSG-8 Series

Advanced GNSS Simulator

Getting Started Guide



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About this Guide

The GSG-8 Getting Started Guide is designed to describe the hardware features, physical connections, and initial simulations of the GSG-8. For full explanations of the features found within the SKYDEL software, you should refer to the SKYDEL manual, found within the application, by navigating to the Help Menu and selecting Help Contents.

1. Included Parts List

GSG-8 contains the following internal components:

Description	Quantity
Computer system: Intel XEON W-2245, 2x16GB RAM DDR4, 1TB SSD NVMe, Nvidia Quadro RTX-A5000	1
Dektec DTA-2115B PCIe Software-Defined Radio	1 to 4
Safran CDM-5 10MHz Reference Clock and PPS distribution Module	1
Cross RF 50 Ohm SMA Terminator	0* to 2
Amphenol Type F Terminator	1 to 4
Cross RF 4.25 inch SemiFlex BNC-Right-angle plug MCX-Straight plug	2 to 8

Your GSG-8 is shipped in one box with the following ancillary parts (depending on your model number):

Part Number	Description	Quantity
CA01R-BNMX-7030	CBL ASSY (M)MCX TO (F)BNC, 30CM	2
CA01R-SASA-2031	CBL ASSY SMA PLUG LMR 195 12"	0* to 4
MP37R-0005-0401	INSTOCK Wireless 4 WAY Combiner, SMA FEMALE, 698 - 2700 MHZ, 50 OHM COAX	0* or 1
CA01R-SASA-2092	CBL ASSY SMA PLUG LMR 195 36"	1
AT05R-SASA-1000	Attenuator 10dB SMA	1
AT05R-SASA-2000	Attenuator 20dB SMA	1
AT05R-SASA-3000	Attenuator 30dB SMA	1
CP01R-DCBK-5018	Mini-Circuits DC-Block	1
SKY-LIC-DON	SKYDEL Keylok3 USB License Dongle, blue	1

*None included with GSG-811 (only one RF output)

2. Required Customer Parts

To access the GSG-8 and for full communication, it is necessary to connect a customer-supplied monitor, keyboard, and mouse.

3. Safety Information

DANGER: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION: This equipment does not have any user-serviceable parts. If the equipment needs to be opened, you should contact technical service.

CAUTION: This symbol indicates the risk of damages to persons or material. If material damages occur, there can be further damages which can cause death or injury to body or health. This symbol on the equipment indicates that this user manual is to be consulted for instruction or further information provided for safe operation.



CAUTION: This product is provided with a protective earth ground incorporated into the power cord. The front panel switch is not a line switch. The AC power cord is the disconnecting device that disconnects the signal generator mains circuits from the mains supply. Alternatively, an external switch or circuit breaker, readily identifiable and easily reached by the operator, may be used as a disconnecting device.

3.1. Installation Safety Considerations

Lifting and Carrying:

The GSG-8 is delivered with handles installed on the front panel for use while lifting and carrying. If the weight of the equipment is too heavy to be carried by one person, use two persons and/or use an appropriate tool. In all cases, use the handles and grips of the product to lift and carry it safely. Never rest the GSG-8 on its rear side. This position can cause severe damage to the unit by pushing on the rear connectors and wires.

Orientation:

The GSG-8 must be installed horizontally with the two front panel screws on top. The product logo should be face-up.

Location:

Install your GSG-8 in an indoor, dry environment with temperatures between +0° C and +30° C.

Mounting:

The GSG-8 is supplied with rack mount ears attached to the chassis. To mount the unit in a 19" rack, use 4 rack screws (not provided) to secure the unit, using 2 screws per side.

Ventilation Requirements:

Ensure that the equipment has a minimum of 4 in or 100 mm clearance at the front and the rear to allow proper air ventilation.

3.2. General Specifications

Intended Use:

Safran GSG-8 Advanced GNSS Simulators are used to test GNSS receivers and GNSS systems by generating GNSS signals, as they are transmitted by GNSS satellites. An RF output generates one of the following: upper band GNSS signals, lower band GNSS signals, interference signals (including jamming or spoofing), or additional antennas or vehicles (with SKYMUTI). A GPU provides signal generation processing power, and an additional GPU allows more signals to be generated simultaneously.

Power:

Line Voltage – 100-240 V_{AC}, 50-60 Hz

Power Consumption – GSG-811: Idle – 80 W, Simulation – 200 W

GGG-842: Idle – 120 W, Simulation – 500 W

MAINS supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage

Environmental:

Temperature - +0° C to +30° C (operating), -15° C to +50° C non-condensing @ 12,000 m (storage)

Humidity – 10% to 70% (non-condensing)

Altitude – max operating: 2000 m above sea level, max transport: 4,500 m above sea level

Pollution – Degree 2: Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected.

Mechanical:

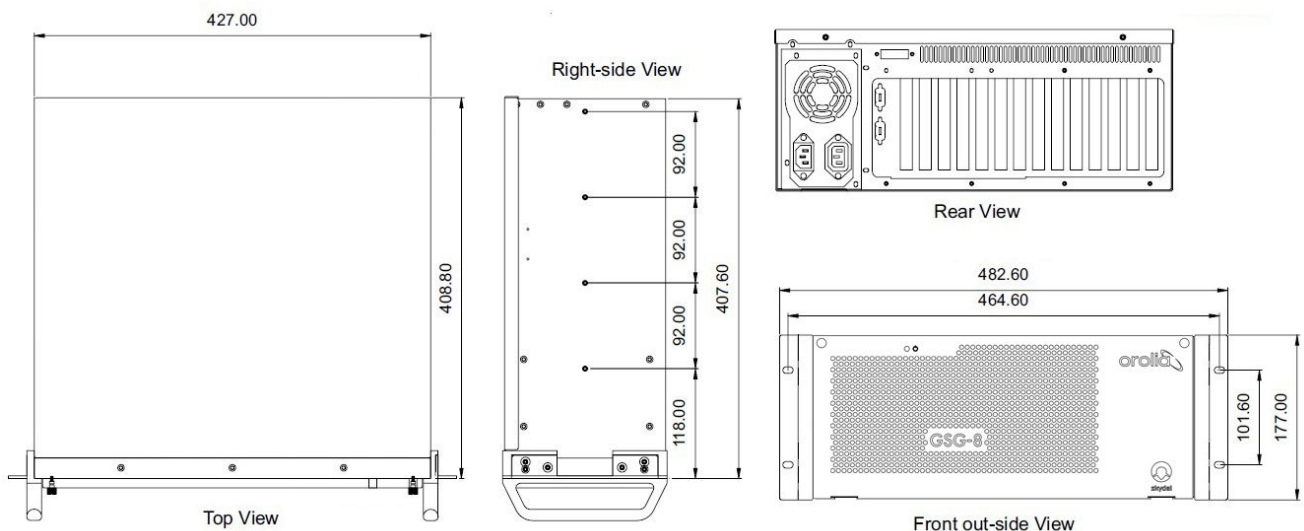
Size: 4U

Depth: 16 in (40.6 cm)

Width: 19 in (48 cm)

Weight: 39.6 lbs. (18kg)

Height: 7 in (18 cm)



Certifications:

Safety: EN/IEC 61010-1:2010

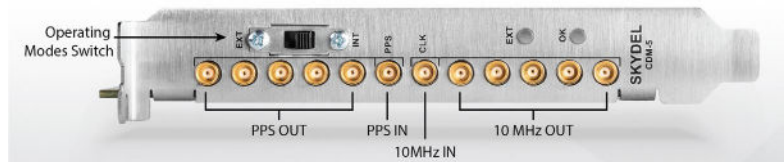
Emissions: EN 61326-1:2013, AS/NZ CISPR 32:2015, EN 55011:2009/A1:2010, EN61000-3-2:2014,

Hardware Parts:

Component	Description
Power Supply	Seasonic 850W Focus
CPU	Intel XEON W-2245
Memory	2x 16GB, DDR4
Drive/Storage	NVMe PCIe 1TB
GPU	1 or 2 PNY Nvidia Quatro RTX-A5000
10 MHz Reference Clock	Safran CDM-5 with on-board OCXO. Accuracy < 100 ppb

Safran CDM-5 Information:

The GSG-8 contains an Safran CDM-5 to distribute a 10 MHz reference clock and 1PPS signals throughout the integrated SDRs. The CDM-5 is added to your GSG-8 to create a maintenance-free timing mechanism. If necessary, it also contains 2 LED indicator lights to provide information about the



current oscillator validity. (See chart below). The CDM-5 has an Operating Modes switch (INT or EXT).

EXT	OK	DESCRIPTION
SOLID	PPS	Normal operation (OCXO at optimal temperature) 10 MHz OUT and PPS OUT generated from OCXO
SOLID	PPS	OCXO is not at optimal temperature
-	SOLID	OCXO Fault
SOLID	SOLID	10 MHz IN not detected
SOLID	PPS	10 MHz IN detected, PPS IN not detected PPS OUT is derived from 10 MHz IN
PPS	PPS	10 MHz IN detected, PPS IN detected

To use the CDM-5 as the simulator's reference clock, the operating modes switch must be set to INT. This is the default setting and will be preconfigured on your GSG-8.

To use the CDM-5 to provide the 10 MHz and PPS signals of an external reference to the simulator, you must turn the Operating Modes switch to EXT, connect your 10 MHz reference clock to the CLK connector of the CDM-5, and connect your 1PPS source signal to the PPS IN connector of the CDM-5.

*PPS indicates LED is flashing at 1 pulse-per-second. A 4-second alternating color pattern occurs during normal boot sequence.

Software:

Component	Description
Operating System	Ubuntu 18.04.6 LTS
Username	skydel
Password	Skydel123
GNSS Simulation Software	Skydel

4.Inputs and Outputs

4.1. Rear Panel Connectors

Sections are identified from left to right. Connectors are identified from top to bottom, left to right.

Power Section:

AC power	Input
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Graphics Card Section:

(4) DP port (RTX-A5000 Graphics Card)	Outputs (4)
(1) USB port (RTX-A5000 Graphics Card)	NOT SUPPORTED

Communication Section:

VGA port	Output
(2) Ethernet ports	Input/Output
(2) USB 2.0 ports	Input/Output
(4) USB 3.0 ports	Input/Output

CDM-5 Card:

(5) PPS	Output
PPS	Input
10 MHz clock	Input
(5) 10 MHz clock	Output

DTA-2115B Card:

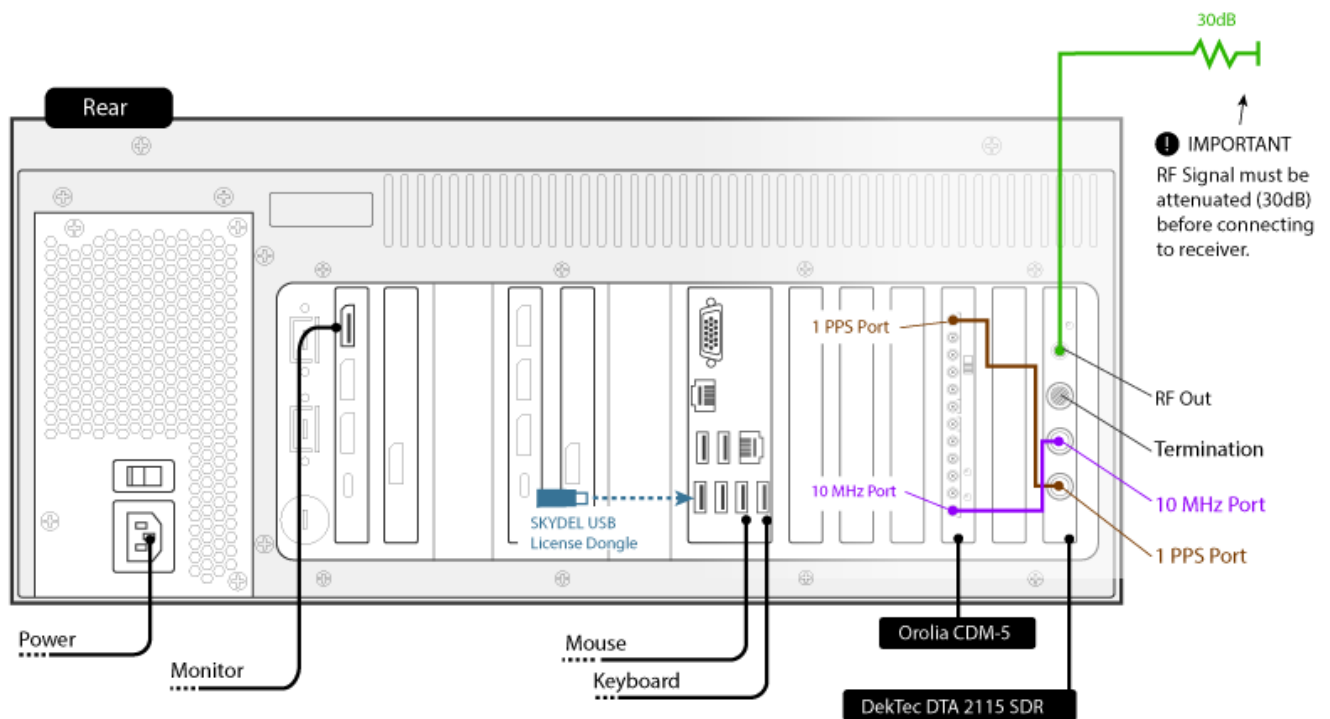
50 ohm SMA RF	Output
75 ohm BNC RF	Output
10 MHz clock	Input
PPS	Input

4.2. Front Panel Connectors

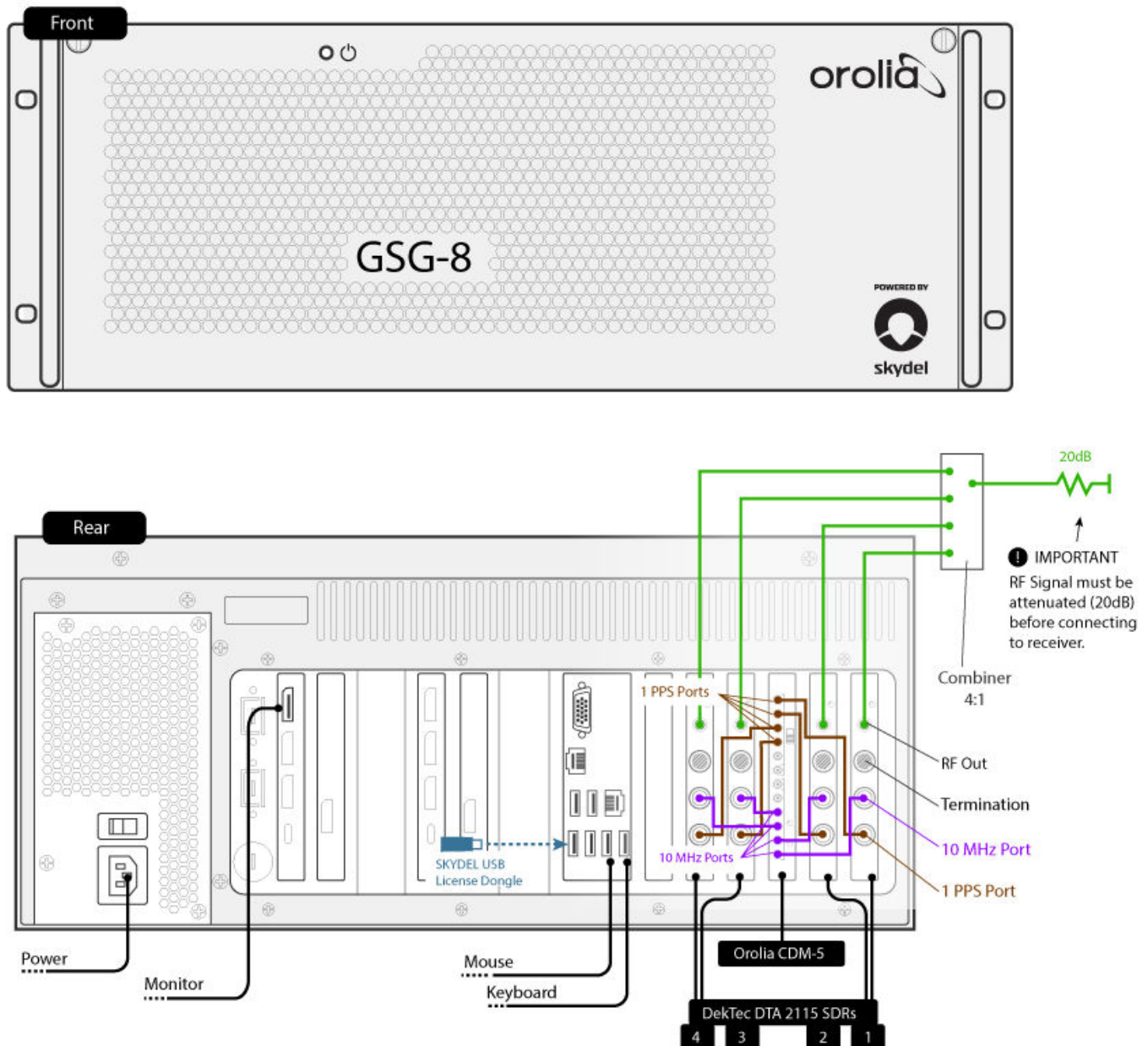
Found inside the front panel cover.

(2) USB 2.0 port	Input/Output
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5. Connection Guide, Single SDR Setup (model GSG-811)



6. Connection Guide, 2,3 or 4 SDR Setup (for models GSG-821, GSG-831, and GSG-842)



6.1. GSG-8 Connections Steps

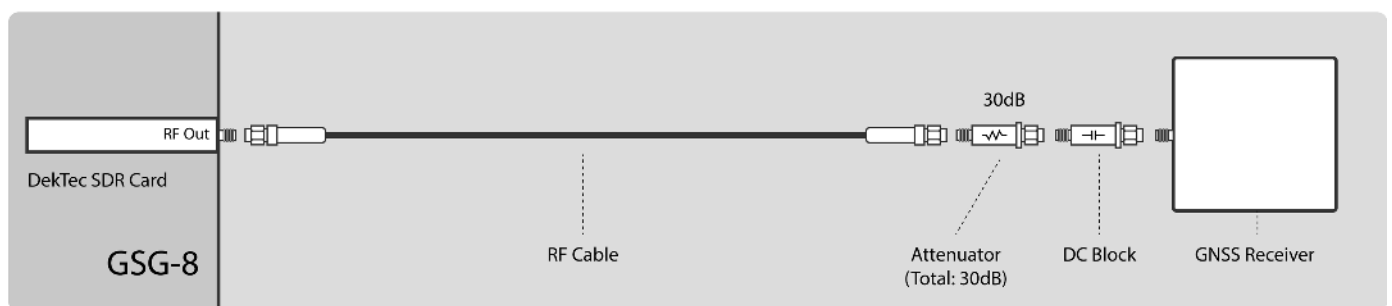
1. Connect the A/C adapter to the power connector on the rear panel of the GSG-8.

CAUTION: Ensure the power cord is not damaged. Install the signal generator so that one of the following items is readily identifiable and easily reached by the operator: AC power cord, alternative switch, or circuit breaker. Insert the mains plug into a socket outlet provided with protective earth grounding.

2. Connect the Safran SKYDEL license dongle into a USB port. (There are 6 functional USB ports on the rear panel near the center of the unit. These can be used interchangeably).
3. Connect your user-supplied keyboard and mouse into two USB ports on the rear of the GSG-8.
4. Connect your user-supplied monitor to the GSG-8 (see above rear panel diagram).
5. Optional connections include connecting your GSG to the internet in order to obtain up-to-date maps. Ethernet ports (2) are provided on the rear of the unit for this purpose.
6. Visually inspect and verify that each of your DekTec DTA 2115 SDRs has one 10 MHz and one 1 PPS connection to the CDM-5 (these connections will be made at the factory before shipment).
7. Next, follow the appropriate steps for your RF connections, depending on your GSG-8 model. (Refer to one of the following sections on either the GSG-811 or for the GSG-821, GSG-831, and GSG-842).

6.2. RF Connections Steps (GSG-811)

Connect the Dektec DTA-2115B's SMA port (RF Out) to your GNSS receiver, replicating the following chain:



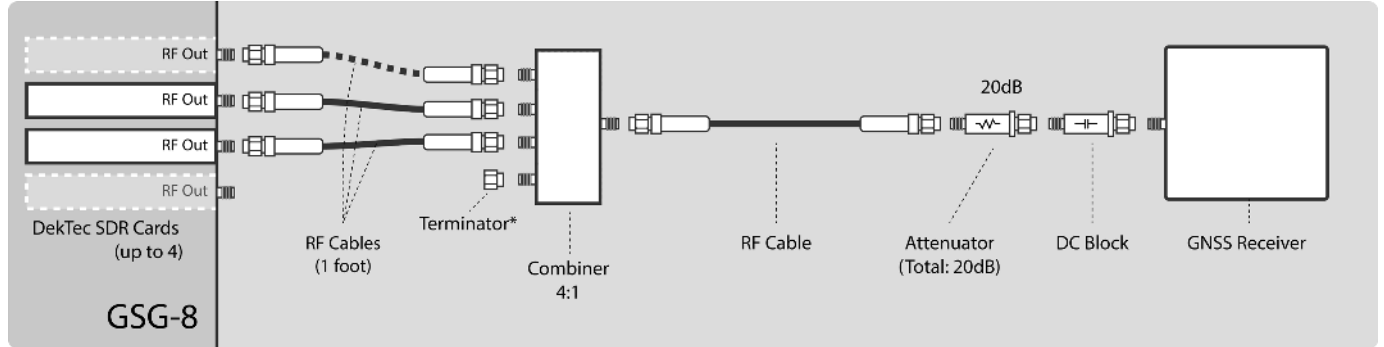
GSG-811 RF Connection Steps

Note: Failure to connect the Attenuator and DC Block could result in equipment damage.

Next, refer to the section on powering up your GSG-8.

6.3. RF Connections Steps (GSG-821, GSG-831, and GSG-842)

Connect all of the Dektec DTA-2115B's SMA ports (RF Out) to the signal combiner, and to your GNSS receiver, replicating the following chain:



GSG-821, GSG-831, and GSG-842 RF Connection Steps

*Note: configurations with less than four DekTec SDR cards will require terminators on the unused RF Inputs of the combiner. The terminators will be included with your shipment.

Note: Failure to connect the Attenuator and DC Block could result in equipment damage.

Next, refer to the section on powering up your GSG-8.

6.4. Power up the GSG-8

CAUTION: Read the relevant information in the Safety section before proceeding.

There are two power switches on the GSG-8.

When the GSG-8 is fully connected, turn on the power switch on the rear panel of the unit.

Next, open the front panel by unscrewing and pulling the two access screws near the top, and turn on the power switch on the internal front panel.



Front Panel Access Screws



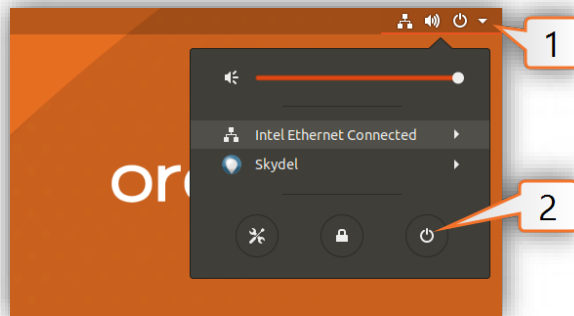
Internal Front Panel Power Switch

Close the front panel when finished.

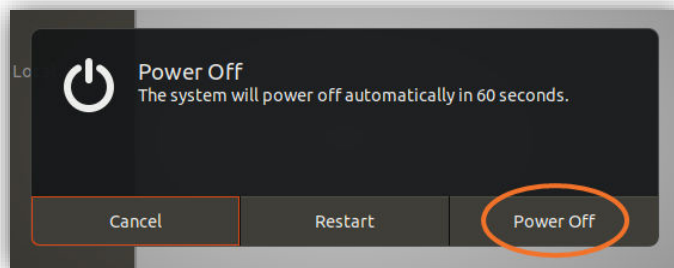
6.5. Power down the GSG-8

To power down the GSG-8 without safety concerns or loss of data, follow the steps below.

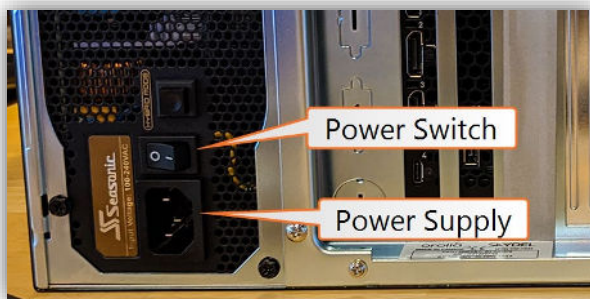
1. Power off the operating system (Ubuntu) instance running on the GSG-8 unit:
 - Navigate to the main system menu (1), and select the “power” icon (2):



- Choose the Power Off button in the popup window.



2. Turn off the power supply switch on the rear of the GSG-8 unit.



GSG-8 rear panel

3. Disconnect (unplug) the power supply cable on the rear of the unit.

7. Running Your First Simulation

Note: This section contains information taken from the SKYDEL User Manual.
The complete manual can be accessed from within the application’s help menu.

If you are new to SKYDEL, we recommend that you follow the instructions in this section to create your first configuration. This is a quick walkthrough of the necessary steps to get a simple GNSS simulation up and running. Refer to the Settings section of the user manual if you would like more details on a particular topic.

This section assumes you have a single radio setup using the Dektec DTA-2115B PCIe SDR.

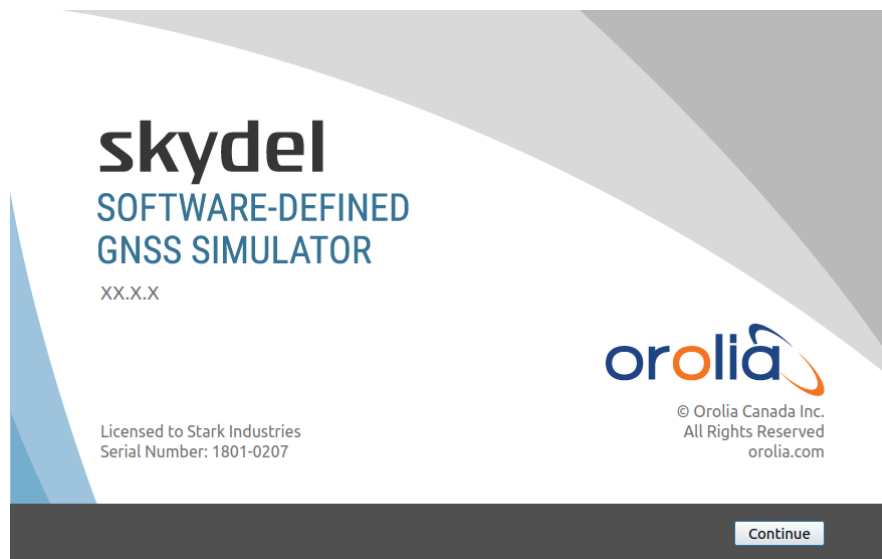
7.1. Apply a License File

Your GSG-8 includes a “floating” license to Safran’s SKYDEL software. This license is contained on a USB dongle (included with your shipment). If the dongle is connected to your GSG-8, the license file will be available.

To view and verify your license information is correctly applied, navigate to the SKYDEL software, click on the Help tab, and select About Skydel.

7.2. Start SKYDEL and Create a New Configuration

When starting SKYDEL, you should first see the SKYDEL Splash Screen:



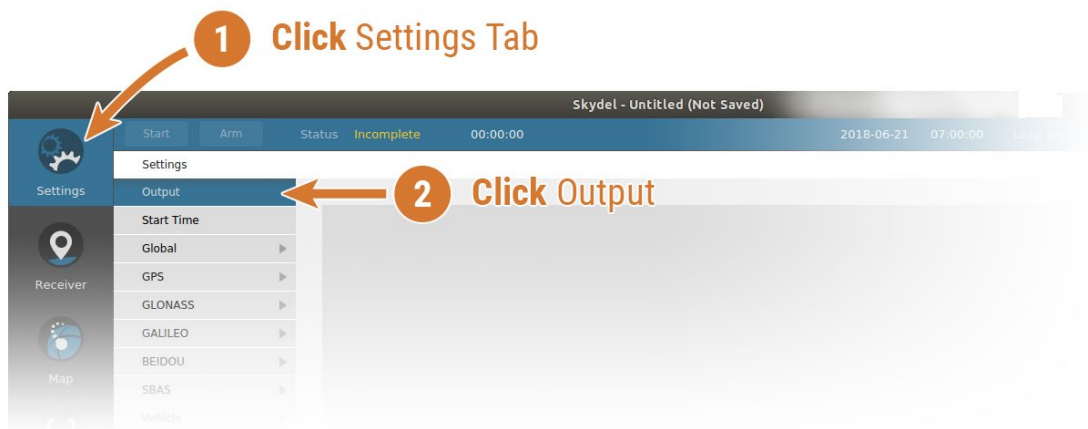
Click “Continue”, and then Select “New Configuration”.



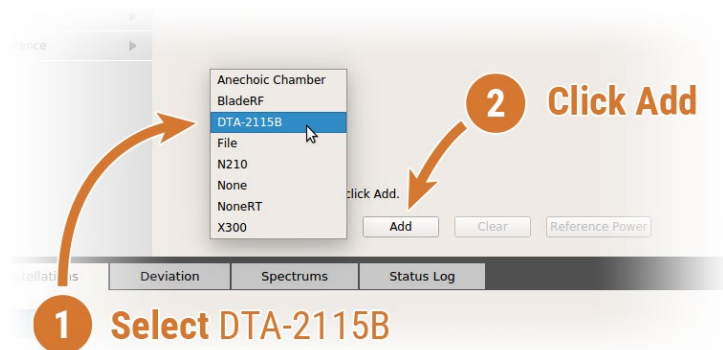
7.3. Add a Radio

NOTE: This step is only necessary to add additional radios; a first radio will be preconfigured on your default configuration. Multiple setup options are possible; refer to the main SKYDEL manual for more information.

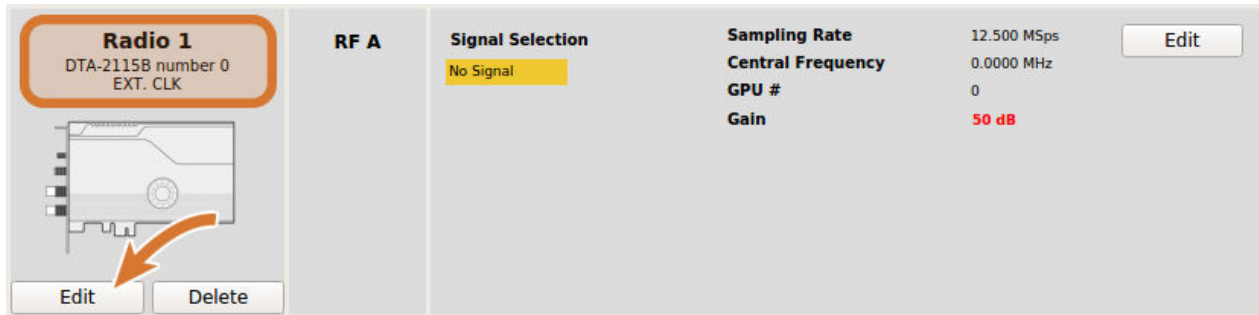
To add a radio, navigate to **Settings - Output**.



Select the DTA-2115B in the dropdown list and click the **Add** button.

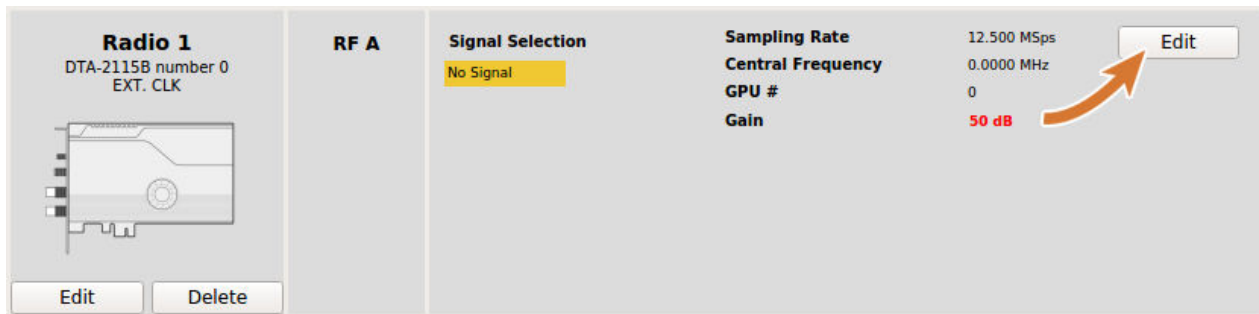


The DTA-2115B will be added with a default device number 0 and default clock settings. If the default values are incorrect for your hardware setup, click **Edit** to make the necessary changes and click **OK** when done.

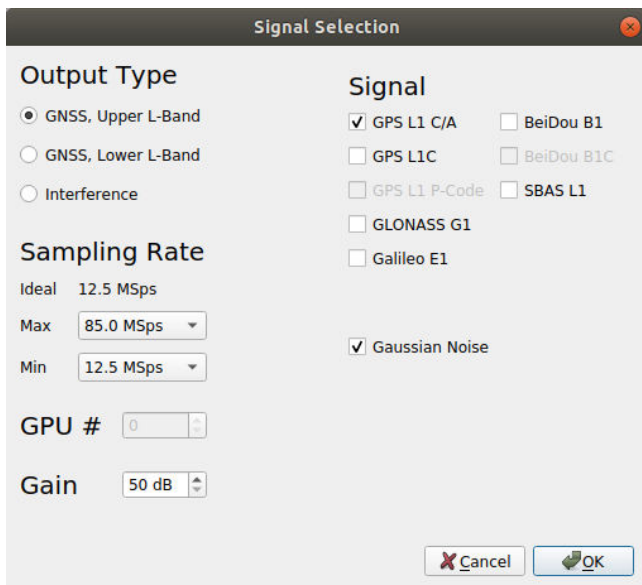


7.4. Select GNSS Signals

Click the Edit button for the RF A output of Radio 1.



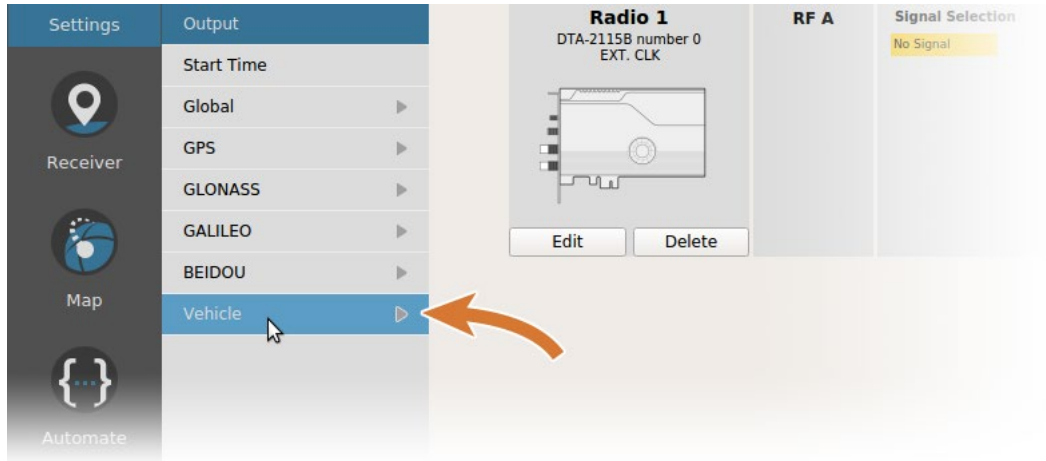
Select GPS L1 C/A and click Ok.



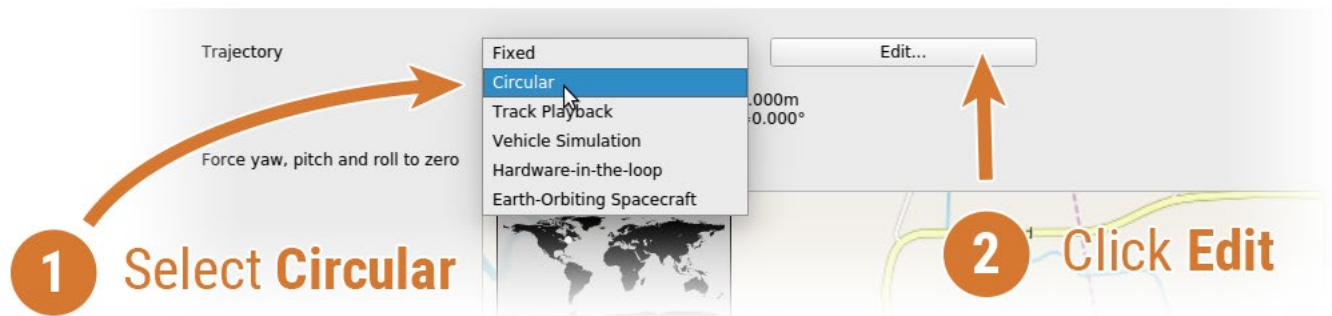
For more information about signal selection, refer to the output section in the full SKYDEL user manual.

7.5. Select Vehicle Motion

Next, we will configure our vehicle to travel in a circle. Navigate to **Settings - Vehicle - Body** to change the vehicle motion settings.



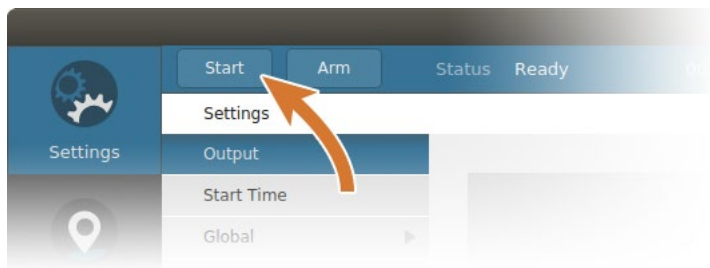
Select Circular from the dropdown list to choose circular trajectory. Other details, such as location, speed, and radius of the trajectory can be modified by hitting Edit.



To navigate back to the **Settings**, click the back arrow in the Settings Menu.

7.6. Start the Simulation

To start the simulation, click the Start button. This action is only available when the status is Ready.



The simulator state will change to Initializing for approximately 10 seconds and if the hardware setup is properly done, the state will then change to Streaming RF. Now the simulation is running.

While the simulation is running (Streaming RF), you will see the elapsed time advance. The Stop button stops the simulator and the RF streaming while the Pause button will slow the vehicle to a halt while the simulator continues to stream RF. If you click on the Analysis tab, you will see the vehicle is not moving when you Click Pause, and starts moving again when you click Resume.



If your GNSS receiver is streaming NMEA to a serial or USB port, you can connect to your receiver to parse and analyze the NMEA data in real-time.

To learn more about using SKYDEL, consult the full user manual by accessing it from within the application.

8. Additional Configuration

The SKYDEL software contained within your GSG-8 is designed to be flexible and highly configurable. As such, there are many different potential settings to explore.

Additional information on the settings available in SKYDEL can be found in the full SKYDEL User Manual. While a SKYDEL instance is running, navigate to the HELP menu and select HELP CONTENTS to view the full product manual.

9. Maintenance

To extend the life of your GSG-8, a few minor maintenance tasks are recommended.

Recalibrate your GSG-8

Recommended once every 24 months. To recalibrate your GSG-8, you must contact Safran support.

Clean Filters

Recommended once every 6 months. To clean the filters of your GSG-8, turn off the unit via the power switch on the rear panel. Open the front panel using the two pin releases at the top of the unit. Open the filter by releasing the four screws, and clean the filter using compressed air or a dry towel. Replace the filter cover and close the front panel.



Front Panel Access Screws



Internal Front Panel Filter Access

Update Software

The GSG-8 internal software undergoes regular updates. The current version installed on your GSG-8 will display on the splash screen and can also be found in the Help menu under About Skydel. See the next section for contact information.

10. Support and Updates

If you encounter a problem with the setup of your GSG-8, do not hesitate to contact Safran Canada support: simulationsupport@nav-timing.safrangroup.com.

To access files resources including third-party tools, drivers, and future SKYDEL releases, please navigate to the URL below:

URL	https://users.skydelsolutions.com
User Name	skydel
Password	

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