narda
Safety Test Solutions

SignalShark

Real-Time DF Receiver Module

Real-Time DF Receiver Module SignalShark® 3340, for the Detection, Analysis, Classification and Localization of RF Signals between 8 kHz and 8 GHz.
Supports automatic direction finding and TDOA. Solves complex measurement and analysis tasks reliably and quickly with outstanding RF performance.

This module is designed for installation in customer-specific systems. Fans have been omitted for low-maintenance use. Heat is therefore dissipated via the housing. The system is designed as an open platform and is based on a Windows-embedded operating system, which makes it possible to run your own programs.

› Frequency range 8 kHz to 8 GHz
› Wideband frequency monitoring with an extremely fast scan rate of up to 50 GHz/s
› Covers whole frequency bands with a 40 MHz real-time instantaneous bandwidth and a very high frequency resolution
  › FFT overlap at least 75 %
  › FFT size: up to 16 384
› Reliable signal detection due to signal duration with 100 % POI
  › > 3.125 µs without attenuation and spectral growth
  › > 2 ns with attenuation proportional to the spectral growth
› Measures weak signals in the presence of strong transmitters with a receiver based High Dynamic Range (HDR)
› ITU-compliant measurements and applications
› Two independent FFT and receiver path allowing signal visualization as well as signal analysis and demodulation at a time
› Common used SCPI standard for remote control
› VITA 49 streaming (sample rate up to 25.6 MHz) allowing storage and post processing of the signal raw data.
› Modular design
  › Third-party applications can additionally be hosted on the embedded Windows 10 based device
  › Can also be operated by an additional touch screen (USB + Display Port) or via Remote Desktop
  › Can handle additional USB devices like mass storage, LTE modem, printer or sensors and actors

Take up the frequency spectrum challenges of today and tomorrow

Seven Senses for Signals

Description

The SignalShark is available in different forms. The form factor of the DF Receiver Module makes it easy to integrate into custom housings. The use of well-documented SCPI reference commands and VITA 49 compliant IQ streaming allows easy integration into every software environment.

The SignalShark is equipped with an excellent RF front-end with outstanding sensitivity and dynamic range, and which also provides four switchable RF inputs. In Scan mode, it operates as a super-fast spectrum analyzer. It computes FFTs of up to 16,384 points with at least 75% overlap within its real-time bandwidth of 40 MHz. This means that every signal event can be detected reliably, even if it is extremely short and infrequent.

There is an independent receiver path in addition to the spectrum path. The center frequency and channel bandwidth of this path are freely selectable within the 40 MHz real-time bandwidth. The receiver path is equipped with functions for channel level measurements, modulation analysis, audio demodulation, and IQ streaming.

The SignalShark supports the use of Narda automatic direction-finding antennas (ADFA). Bearing cycles as short as 1.2 ms can be achieved. The integrated map and localization software allows reliable homing-in on the signal, even in an urban environment.

The SignalShark is an excellent choice for every localization system based on TDOA, thanks to precise timestamp synchronization and Vita 49 IQ streaming. The reference clock can be selected from the PPS signal of the internal GNSS receiver, or that of the ADFA's GNSS receiver, or from a dedicated PPS input.

The powerful CPU of the SignalShark can run third-party software and scripts, which makes it easy to extend the capabilities of the SignalShark or to build up a customized stand-alone system..
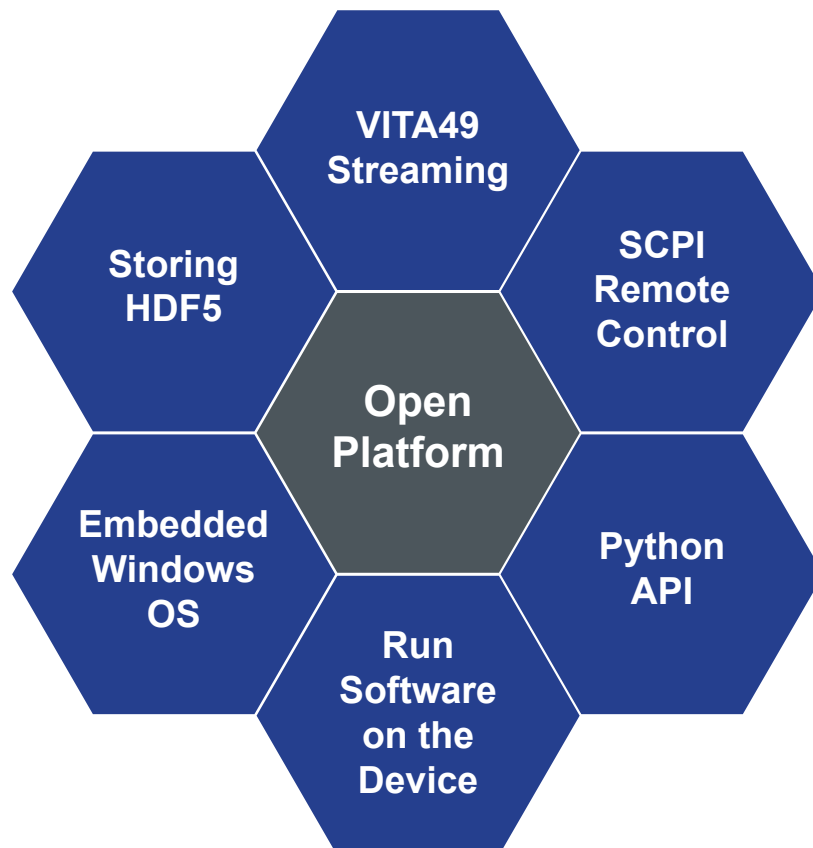
Applications

The SignalShark is ideal for applications requiring high sensitivity, high dynamic range, reliable detection of very short and infrequent signal events, and transmitter localization. These requirements are all essential for radio monitoring. Radio monitoring can take different forms, depending on the why it is needed. For example, regulators may monitor the spectrum to ensure that vital public safety and security services run reliably, and that licensed parts of the spectrum are used only by the license holders. The armed forces need to know the actual usage of the spectrum in order to gather tactical or strategic information about potential enemies. Police and intelligence agencies may be interested in the content or at least the meta-data of some signal transmissions, and may also need to locate transmitters used for eavesdropping. Cellular network providers need to be able to quickly trace the source of harmful interference.

The high sensitivity and high dynamic range of the SignalShark ensures that the signals of interest are not hidden in the noise floor and that signal artifacts due to intermodulation will not be confused with real signals. The extraordinarily high FFT overlap in real-time spectrum mode ensures reliable detection of extremely short and/or infrequent signal events. Modulation analysis and occupied bandwidth measurements help regulators to make sure that spectrum usage is as intended. The audio demodulator assists in the classification of analog modulated transmissions under investigation. IQ streaming enables third-party software to also be used to classify and decode digital transmissions. The use of Narda automatic DF antennas with the integrated statistical localization algorithm allows localization of transmitters, based on AOA. The SignalShark has already been proven to be easily integrated into third-party TDOA systems. Its superior synchronization properties are essential for reliable TDOA-based localization.

Although the SignalShark is optimized for radio monitoring, it can certainly also be used in most applications where a general-purpose spectrum analyzer would normally be required, often providing better RF performance, higher speed, and ease of integration. Its open platform for third-party software and scripts allows fully customized stand-alone solutions that can replace the large, complicated systems that were previously necessary

Tasks and Views

Customer applications have formed the basis for the design of the SignalShark family and the layout of the graphical user interface (GUI). This is most clearly seen in the concept of Tasks and Views.

All SignalShark devices are supporting the same GUI. The devices can be accessed with remote desktop software via a network.

Tasks

Measurements often consist of a workflow of several steps, such as locating a signal in the spectrum, measuring its level and analyzing its behavior. This involves switching between different measurement modes and settings in each mode when a general-purpose analyzer is used.

However, with the SignalShark, the entire measurement workflow is handled by one or more measurement tasks. These tasks are shown as screen tabs, just like the web pages displayed by a web browser. Each task encapsulates all the measurement parameters and the underlying measurement engine mode. All the measurements in a task are performed at the same time. Up to six measurement visualizations (Views) can be added to adapt a task as required.

The SignalShark provides several task modes to support a wide variety of measurement applications.

Spectrum (Scan) Task
This task supports measurement of the spectrum over the full frequency span of 8 kHz to 8 GHz in a single measurement at a maximum measurement speed of 50 GHz/s.

Real-Time Spectrum Task
Real-Time Spectrum task enables spectrum measurements with a frequency span of up to 40 MHz in real-time. All frequencies within the frequency span are acquired simultaneously with no time gaps and with a FFT frame overlap of 75%. The FFT frame overlap increases to 87.5% for frequency spans of 20 MHz or less. A second digital down converter is used at the same time for analyzing and demodulating the IQ data of a separate channel within the 40 MHz real-time bandwidth. The frequency and bandwidth of this channel are selectable.

Auto DF Task
This task supports the use of the Narda Automatic DF Antenna (ADFA). Each bearing cycle can be as short as 1.2 ms and even the bearings of pulsed signals can be reliably determined as long as the minimum pulse and gap durations are somewhat longer than 2 cycle times. The optional available map and localization functionality, which is integrated into the SignalShark GUI, allows the reliable localization of transmitters. The sophisticated state of the art algorithm based on the bearing statistics

Fig. 1.   RT Spectrum view (View 1) and Spectrogram view (View 1) in a task (Task 2)

reliably eliminates the influence of false bearings on the localization result, as long as there are enough line of sight bearings available from enough locations.

Real-Time Streaming Task
IQ data can be streamed at sample rates of up to 25.6 MHz using the VITA 49 protocol (option). The stream sink can be an external device connected via the LAN interface or a third party application running on the SignalShark itself for deeper analysis or decoding of signals.

IQ Analyzer Task
IQ Analyzer with 1.6 GB ring buffer, real-time trigger, time domain analysis and spectrograms with time resolution down to nanoseconds. Up to 1.6 GB of IQ data can be continuously recorded in a ring buffer. This allows recording of a 40 MHz channel over 5 seconds. Narrower channels can be recorded for a correspondingly longer time. Short-term or sporadic signals can be detected via various trigger functions.

The recorded values can be displayed simultaneously as a IQ Spectrum View, IQ Spectrogram View, and a IQ Magnitude View. The special feature here is that it is possible to switch between a high time resolution and a high frequency resolution even after the measurement. This allows a signal to be analyzed in its entire depth. Up to eight markers support the determination of signal parameters.
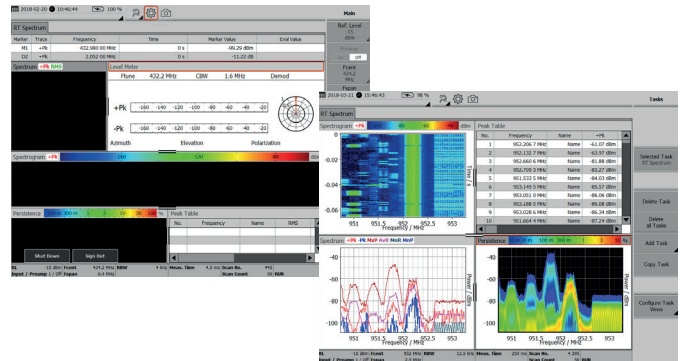
Views

Measurements are visualized by means of different views. The frequency domain and channel level can be viewed at the same time, for example, by adding a spectrum view and a level meter view to a measurement task. Up to six views can be added to a task. As default each new task opens with a Spectrum view.
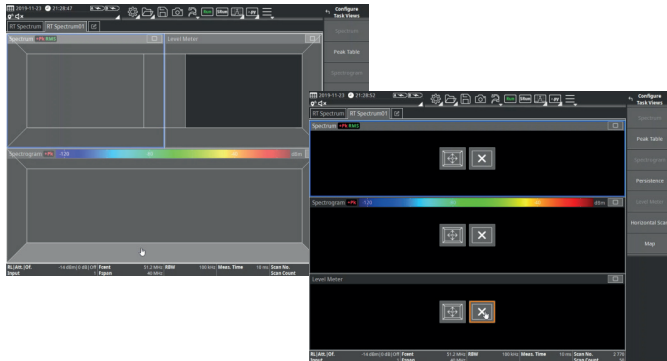
The currently selected view is marked by a blue border. The content and layout of the "Button Bar" to the right, and the "Measurement Information Bar" at the bottom, depends on the currently selected view.

The type, arrangement and size of a view can be adapted by the user. It is possible to save the current configuration and arrangement of Tasks and Views into setup files.

Tasks and Views						
		Measurement Engine or Task Mode				
		Spectrum (Scan)	RT (Real-Time) Spectrum	Auto DF	RT Streaming	IQ Analyzer
View	Spectrum	✓	RT	✓		✓
	Peak Table (of Spectrum)	✓	RT	✓		
	Spectrogram	✓	RT			
	Level Meter		✓			
	Persistence		RT			
	Map	✓	✓	✓		
	Bearing			✓		
	Horizontal Scan		✓			
	IQ Magnitude (zero span, scope)					✓
	IQ Spectrum					✓
	IQ Spectrogram					✓
	VITA 49 FFT Streaming				✓	
	VITA 49 IQ Streaming				✓	

Device Features

Options (Views) and Scripts

An extensive set of equipment comprising frequency scanner/receiver, transmitter detector, spectrum analyzer, signal analyzer, directional antennas, amplifier, compass, triangulation software and maps was usually necessary in order to reliably detect, analyze and localize RF signals and interference. The SignalShark combines all these functions in one device.

Options (Views)

40 MHz real-time Spectrum, Marker and Peak Table (included in all Basic Sets)
A Panorama scan display that provides extremely fast scanning over the entire frequency range and is ideal for detecting, monitoring and analyzing any kind of signal.
An ideal complement: Mark suspect signals in the spectrum and save them in a transmitter table with relevant parameters such as center frequency, bandwidth, antenna type, and polarization. This table can then be recalled and worked through successively at each measurement location and in every operating mode of the instrument.
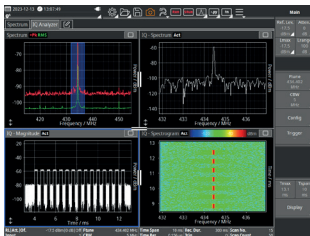
IQ Analyzer, Recorder, Trigger, Magn. View [option]
The IQ Analyzer is optimal when it comes to detection, analysis and documentations of hopping signals as well as of interference signals caused by faulty oscillator, welding systems, defective relays or lamps, jammers etc. It trigger on short pulsed signals down to ns and has a high time resolution analysis in IQ Spectrogram View and IQ Magnitude View.

› Time Res. IQ Magnitude down to 20 ns (CBW 20 MHz, Oversampling On)
› Time Res. IQ Spectrogram down to 320 ns (CBW 20 MHz, Oversampling On, RBW 766.2 kHz, 87.5 % Overlap)
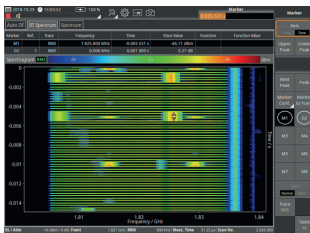
Spectrogram [option]
The Waterfall diagram is ideal for long term monitoring of the RF spectrum and for detecting permanent, sporadic or frequency hopping signals. Transmitters with variable output power and/or bandwidth can also be identified.
Visual representation of the recorded spectrums versus time. Colors represent the signal level. The smallest selectable time resolution is 31.25 µs. The high resolution makes it possible to display even the frame structures from for services like UMTS, LTE 5G.
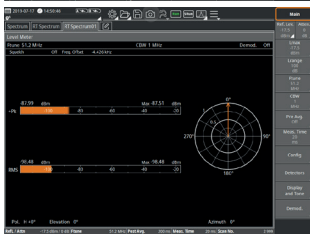
**Level Meter incl. Compass values [option]**
The option allows you to make selective measurements at a defined frequency (Fcent) e.g. for monitoring the field strength of a communications channel. The measurement is in real-time and there are no time gaps.
The results are shown from an independent receiver path with steep channel filters for clean separation of even closely spaced frequencies and has a CBW range from 25 Hz to 40 MHz for detection and evaluation of pulsed signals (radar) as well as broadband signals.
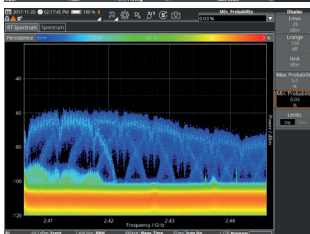
Persistence (of real-time Spectrum) [option]
The Polychrome spectrum displays spectra as level versus frequency where color indicates rate of occurrence. Persistence allows sporadic to CW (continuous waveform) signals to be detected easily. It can also be described as a visual detection of signal under signal, e.g. a detection of interferers/jammers hidden under a signal.
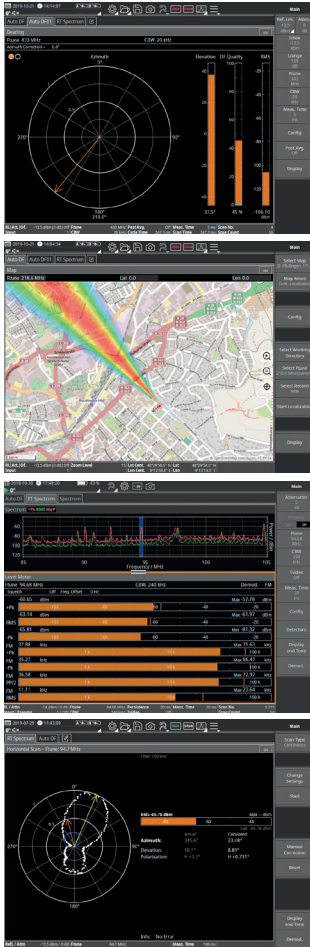
Automatic DF Antenna Control, Bearing View [option]

A view for Direction finding, showing azimuth, elevation, DF quality, and omnidirectional RMS level derived from the Narda automatic DF antenna (ADFA). The ADFA elevation is calibrated between +40° und -20°.

Mapping and Localization [option]

SignalShark simplifies localization of transmitters by autonomously evaluating all the available bearing results and plotting them on a map. It uses a statistical distribution of bearing lines that represents the uncertainty in the bearing. The result is a map on which the possible locations of the transmitter are plotted and color-coded according to their probability.

Make a drive test using a vehicle mount-adapter, combine bearings from more than 2 SignalSharks (NSL Remote DF) or mount the ADFA 2 180° upside down. There are many features developed to facilitate and broaden the possibilities for most individual cases.

Analog Demodulation [option]

for signal identification and decoding. AM, Pulse, CW, ISB, USB, LSB, FM, PM, or IQ signals can be demodulated with squelch and AGC function. The demodulated signal can be stored as WAV-file.

Horizontal Scan [option]

plots the signal strength versus the angle of incidence on a polar diagram. The display allows you to more easily see the difference between the received signal and the reflections that occur. The SignalShark automatically calculates the bearing of the signal source based on the horizontally measured values.

SCPI Remote Control [option]

SCPI (Standard Commands for Programmable Instruments) is a language that makes it possible to control the SignalShark using standard syntax, command structure and data interchange format. All remote commands are described in Command reference guide for SignalShark

The SCPI Remote Control allows the Narda Script Launcher to be installed.

VITA 49 [option]

is a packet-based exchange protocol for RF devices. The Vita49 standard provides a communications format that is hardware and supplier-independent

Shows the basic measurement parameter settings while streaming IQ data according to the Vita 49 standard

IQ Data stream can be used for classification, decoding (3rd party SW) of signals.

Narda Python Scripts

NSL (NardaScriptLauncher) is a free software from Narda that allows SignalShark users to select and run Python scripts from within the SignalShark application

› Automate routine tasks
› Provide guided measurements for novices using message boxes or wizards
› Add new measurement evaluation functions
› Provide complete measurement automation
› New scripts constantly released to be downloaded for free
› Possibility to write programs or additions via Python, using a Narda template, customized for specific needs
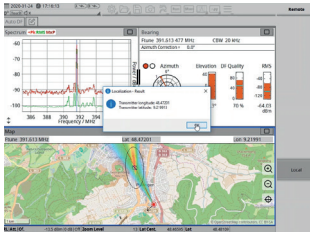
NSL Remote DF (NSL Net DF)

makes it possible to create a localization with several SignalShark devices in a network. The user can scan the network to obtain information on all available SignalShark devices, synchronize all devices with configuration settings of the master device, monitor spectrum reception on all devices simultaneously, and use the bearing information to perform localization on the master SignalShark device.
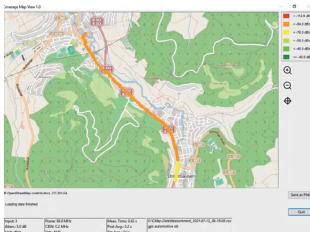

NSL Coverage Map

The user can configure settings for the coverage map and take location-dependent level measurements with distinct color-coding.

Drive test for coverage, field strength correlated to color scheme


NSL DF Autopilot

The function allows the SignalShark to be connected to a navigation system. The coordinates determined by the SignalShark heatmap localization are set as target in the navigation system, thus *There is no need to look at the heatmap while driving and only one person is needed*.
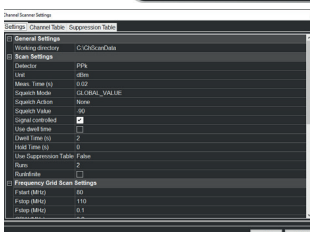
NSL Channel Scanner

A memory/frequency scan that makes it possible to monitor predefined channels in the spectrum. It is comparable to a channel scan on a radio. If one of the monitored channels exceeds a definable level value, an action ("Action") previously defined by the user can be executed. It is also possible, to scan a frequency grid. This can be used to create a channel table.
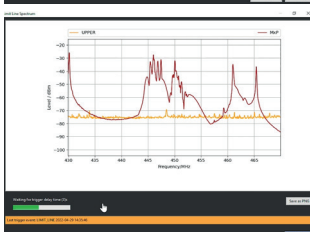
NSL Limit Line

enables triggering on signals in the spectrum. The trigger level can be defined by a horizontal line or by a trigger mask. The trigger mask can be created and edited in the settings editor in various ways.

NSL GNSS

displays information about the current GNSS reception and issues a warning message if the quality of the GNSS reception falls below a certain level.

NSL MS Word

takes a Word (.docx) template file as the basis for a measurement report. It reads all settings from the current measurement, makes a screenshot of each view and generates a measurement report as MS Word document

NSL Tools

› NSL Copy Settings, copies selectable parameters such as Fcent, RBW and Attenuator from one task to another task.
› NSL Go 2 desktop, emulates the Windows-Key + "D-Key" keytroke to go to the Windows desktop
› NSL Save Peak Table, allows to save the information of a peak table in CSV format.
› NSL IQ Stream Control, allows to configure and start an IQ stream easily.
› NSL Peak trigger, uses the peak table view of SignalShark to stop the measurement when reaching or exceeding a user defined level.
› NSL SignalShark WOL, allows to switch on a network connected SignalShark via WakeOn-LAN.

NSL Converter

› Convert SignalShark Spectrum Data (from HDF5 (.h5) file format to csv file format)
› Convert SignalShark Spectrogram Data (from HDF5 (.h5) file format to csv file format)
› Convert IDA (csv-based transmitter tables) to SignalShark (xml-based tansmitter tables)
› Convert SRM (csv-based transmitter tables) to SignalShark (xml-based transmitter tables)
› Convert a Template Generated CSV Table (from csv-based transmitter tables to xml-based transmitter tables)

NSL IQ Recorder settings

enables the recording of IQ data in WAV format.
Allows the user to setup and start/record the IQ streams by using SignalShark SCPI commands and save them as an IQ WAV file. The WAV file format is a universal format supported by many monitoring software products and SDR programs.
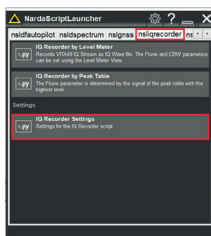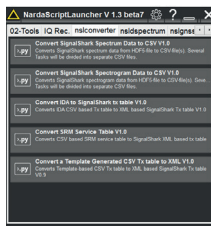
Definitions and Conditions

Conditions
Unless otherwise noted, specifications apply after 30 minutes warm-up time within the specified environmental conditions. The product is within the recommended calibration cycle.

Specifications with limits
These describe product performance for the given parameter covered by warranty. Specifications with limits (shown as <, ≤, >, ≥, ±, max., min.) apply under the given conditions for the product and are tested during production, considering measurement uncertainty.

Specifications without limits
These describe product performance for the given parameter covered by warranty. Specifications without limits represent values with negligible deviations, which are ensured by design (e.g. dimensions or resolution of a setting parameter).

Typical values (typ.)
These characterize product performance for the given parameter that is not covered by warranty. When stated as a range or as a limit (shown as <, ≤, >, ≥, ±, max., min.), they represent the performance met by approximately 80% of the instruments. Otherwise, they represent the mean value. The measurement uncertainty is not taken into account.

Nominal values (nom.)
These characterize expected product performance for the given parameter that is not covered by warranty. Nominal values are verified during product development but are not tested during production.

Uncertainties
These characterize the dispersion of the values attributed to the measurands with an estimated confidence level of approximately 95%. Uncertainty is stated as the standard uncertainty multiplied by the coverage factor k=2 based on the normal distribution. The evaluation has been carried out in accordance with the rules of the "Guide to the Expression of Uncertainty in Measurement" (GUM).

Specifications[a]

SignalShark DF Receiver Module

Frequency					
Frequency range	8 kHz to 8 GHz				
Scan rate	> 50 GHz/s		@ RBW = 1.6 MHz (resolution 800 kHz)		
(basic unit, full span)	30 GHz/s (typ.)		@ RBW = 100 kHz (resolution 50 kHz)		
RBW (RT Spectrum)	1 Hz to 800 kHz				
RBW (Scan Spectrum)	1 Hz to 6.25 MHz				
CBW (Level Meter)	25 Hz to 40 MHz				
EMC filter bandwidth (Spectrum and Level Meter)	10 Hz, 100 Hz, 200 Hz, 1 kHz, 9 kHz, 10 kHz, 100 kHz, 120 kHz and 1 MHz				
Detectors (Spectrum and Level Meter)	+Pk, RMS, -Pk, Avg and Sample				
CISPR Detectors (Level Meter)	Cpeak (quasi-peak), CRMS & CAvg (EMC filter with CISPR bandwidth must be selected				
SSB phase noise f_c	**df = 1 kHz**	**df = 10 kHz**	**df = 100 kHz**	**df = 1 MHz**	**df = 10 MHz**
10 MHz	< -120 dBc (1/Hz)	< -130 dBc (1/Hz)	< -135 dBc (1/Hz)		
1 GHz	< -90 dBc (1/Hz)	< -101 dBc (1/Hz)	< -101 dBc (1/Hz)	< -112 dBc (1/Hz)	< -132 dBc (1/Hz)
Internal reference frequency	Deviations: < 1 ppm				
	(includes initial deviation, aging within the first 2 years, and temperature response)				

Amplitude			
HDR (High Dynamic Range)	SignalShark can detect low level signals even in the presence of very strong signals. It does this by combining high sensitivity with a wide intermodulation-free dynamic range. The DANL and IP2 / IP3 values stated below are valid at the same setting.		
	DANL (Noise Figure) @ attenuator = 0 dB, no preamp	1 MHz ≤ f ≤ 44 MHz	< - 160 dB (mW/Hz)	(resultant noise figure < 14 dB)
		44 MHz < f ≤ 3 GHz	< - 159 dB (mW/Hz)	(resultant noise figure < 15 dB)
		44 MHz < f ≤ 3 GHz	- 162 dB (mW/Hz) (typ.)	(resultant noise figure 12 dB)
		3 GHz < f ≤ 8 GHz	< - 152 dB (mW/Hz)	(resultant noise figure < 22 dB)
	2nd order intercept point (IP2, 2 tones) @ attenuator = 0 dB, no preamp	4 MHz ≤ f < 42 MHz[b]	> 60 dBm	
		42 MHz ≤ f ≤ 8 GHz	40 dBm (typ.)	
	3rd order intercept point (IP3, 2 tones) @ attenuator = 0 dB, no preamp	3 MHz < f ≤ 44 MHz	> 20 dBm	
		3 MHz < f ≤ 44 MHz	26 dBm (typ.)	
		44 MHz < f ≤ 630 MHz	> 4 dBm	
		630 MHz < f ≤ 3 GHz	> 6 dBm	
		44 MHz < f ≤ 3 GHz	14 dBm (typ.)	
		3 GHz < f ≤ 8 GHz	> 5 dBm	
		3 GHz < f ≤ 8 GHz	12 dBm (typ.)	
Level uncertainty	9 kHz ≤ f ≤ 8 GHz	< ± 2 dB	
Residual spurs[c] @ attenuator = 0 dB	8 kHz ≤ f ≤ 44 MHz	< -120 dBm	exceptions < -100 dBm
	44 MHz < f ≤ 3 GHz	< -115 dBm	exceptions < -100 dBm
	3 GHz < f ≤ 6 GHz	< -110 dBm	exceptions < -95 dBm
	6 GHz < f ≤ 8 GHz	< -105 dBm	exceptions < -85 dBm
IF rejection	> 80 dB		
Image rejection	> 80 dB		

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a   RF data apply in the temperature range 20 °C to 26 °C at a relative humidity of between 25 and 75 %

b   Component at f1 + f2 is measured in the direct band (Fcent ≤ 64 MHz in real-time mode)

*c   Typically with only few exceptions. These are documented in the calibration certificate*

Real-Time Spectrum

Signal duration for 100 % POI	@ RBW = 800 kHz	> 3.125 µs without attenuation and spectral growth
		> 2 ns with attenuation proportional to the spectral growth
Spectrum rate	1.6 million spectra / s	@ RBW = 800 kHz and 75 % FFT Overlap
FFT overlap	Fspan > 20 MHz	75 %
	Fspan ≤ 20 MHz, RBW ≤ 400 kHz	87.5 %

RF Input

Type (switchable)	4 x SMA-connector, 50 Ω (female)		
RF destruction limit	20 dBm		
Max. nominal RF level	15 dBm		
Maximum DC voltage	25 V		
Return loss (VSWR)	12 kHz ≤ f ≤ 3 MHz	> 9.54 dB	(VSWR < 2.00)
	3 GHz < f ≤ 6 GHz	12 dB (typ.)	(VSWR = 1.67 (typ.))
	6 GHz < f ≤ 8 GHz	10 dB (typ.)	(VSWR = 1.93 (typ.))
Isolation between used and unused inputs	8 kHz ≤ f ≤ 1 GHz	60 dB (nom.)	
	3 GHz	50 dB (nom.)	
	8 GHz	35 dB (nom.)	

General Specifications

Attenuator	0 to 30 dB (0.5 dB steps)	
Digitizer	16 bit	
GNSS	Embedded receiver and antenna (GPS / QZSS, GLONASS, BeiDou, Galileo) Coordinates representation as decimal degree (DegDec - ddd.ddddd)	
Internal non-removable memory	ssD, mSATA	30 GB system partition 28 GB configuration settings and user data
Removable memory	microSD (SDXC) / USB 2.0 / USB 3.0	
External power supply	Basic unit, DC input: 10 to 48 VDC	
	AC adapter, input: 100V-240VAC, output: 12VDC, 5.5A Plug type: Locking Power Plug S10KS17	
Dimensions (H x W x D) (without connectors)	42.5 mm × 202 mm × 209 mm (1.67" × 7.95" × 8.23")	
Weight	2375 g / 5.24 lb	
Country of origin	Germany	
Recommended calibration interval	24 months	

Interfaces

10 MHz Reference input	1 x SMA-connector, 600 Ω (female)
PPS/Trigger input	1 x SMA, 100 kΩ (female)
GNSS Antenna Input (for additional, external GNSS antenna)	1 x SMA, 50 Ω, female (DC voltage for active antennas is supplied)
Video	1 x Display Port
Audio	1 x 3.5 mm headphone jack
Ethernet	1 x GigE (10/100/1000Base-T), RJ45
USB (Host)	1 x USB 3.0, 1 x USB.2.0
SD card slot	1 x microSD-card (SDXC)

Remote Control and Streaming	
Remote control protocol	SCPI
FFT streaming	VITA49 compliant
IQ streaming	VITA49 IQ streaming, sample rate up to 25.6 MHz[d]
Remote Software	Remote Desktop for PC, Tablet and Smartphone (Windows, Android, IOS)

Additional Functions	
Noise power density measurement	Can be measured with up to eight markers at a time.
Channel power measurement	Can be measured with up to eight markers at a time.
Occupied bandwidth measurement	According to ITU-R SM.443-4, with additional automatic center frequency and channel power measurement. Can be measured with up to eight markers at a time.
Field strength measurement	According to ITU-R SM.378-7
CISPR Detectors	Cpeak (quasi-peak), CRMS & CAvg (EMC filter with CISPR bandwidth must be selected)
Modulation detectors	AM, FM and PM. Up to 4 different detectors are available simultaneously
Frequency offset measurement	For CBW ≤ 1 MHz (using modulation detectors)
Analog demodulation and recording	AM, Pulse, CW, ISB, USB, LSB, FM, PM, or IQ signals can be demodulated with squelch and AGC function. The demodulated signal can be stored as WAV-file.
Tone search	For PIM and interference hunting. The level of one of the detectors modulates the pitch of an audible tone.
Automatic DF	Automatic bearing of transmitters using a Narda Automatic DF Antenna.
Automatic transmitter localization (Heatmap)	Automatic calculation of the transmitter location.
TDOA localization[e]	Integrated GPS with high-accuracy timestamp for TDOA applications. With additionally available software package

Heat dissipation		
Thermal resistance (nom.)		0.72 K/W
Permissible temperatures	Main-/ RF-board	< + 83 °C (Warning from + 83 °C, device shutdown at + 85 °C)
	FPGA	< + 104 °C (Warning from + 104 °C, device shutdown at + 106 °C)

Environmental Conditions		
MIL-PRF-28800F Class 2		Operating temperature
		Storage temperature
		Operating temperature
		Random vibration
		Functional shock
		Transit drop
Operating temperature		-20 °C to + 55 °C
Humidity		< 29 g/m³ (< 93 % RH at +30 °C), non-condensing
Climate	Storage	1K3 (IEC 60721-3) extended to - 40 °C to + 70 °C
	Transport	2K4 (IEC 60721-3) restricted to - 40 °C to + 70 °C
	Operating	7K2 (IEC 60721-3) extended to - 20 °C to + 55 °C
Mechanical	Storage	1M3 (IEC 60721-3)
	Transport	2M3 (IEC 60721-3)
	Operating	7M3 (IEC 60721-3)

Compliance		
EMC	European Union	Complies with EMC Directive 2014/30/EU and IEC/EN 61326 -1: 2021
	Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11
	Emission	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B
Safety		Complies with European Low Voltage Directive 2014/35/EU and IEC/EN 61010-1:2010
Material		Complies with European RoHS Directive 2011/65/EU, (EU)2015/863 and EN 63000:2018

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d   *Applies for integrated 1 Gbit Ethernet interface.*
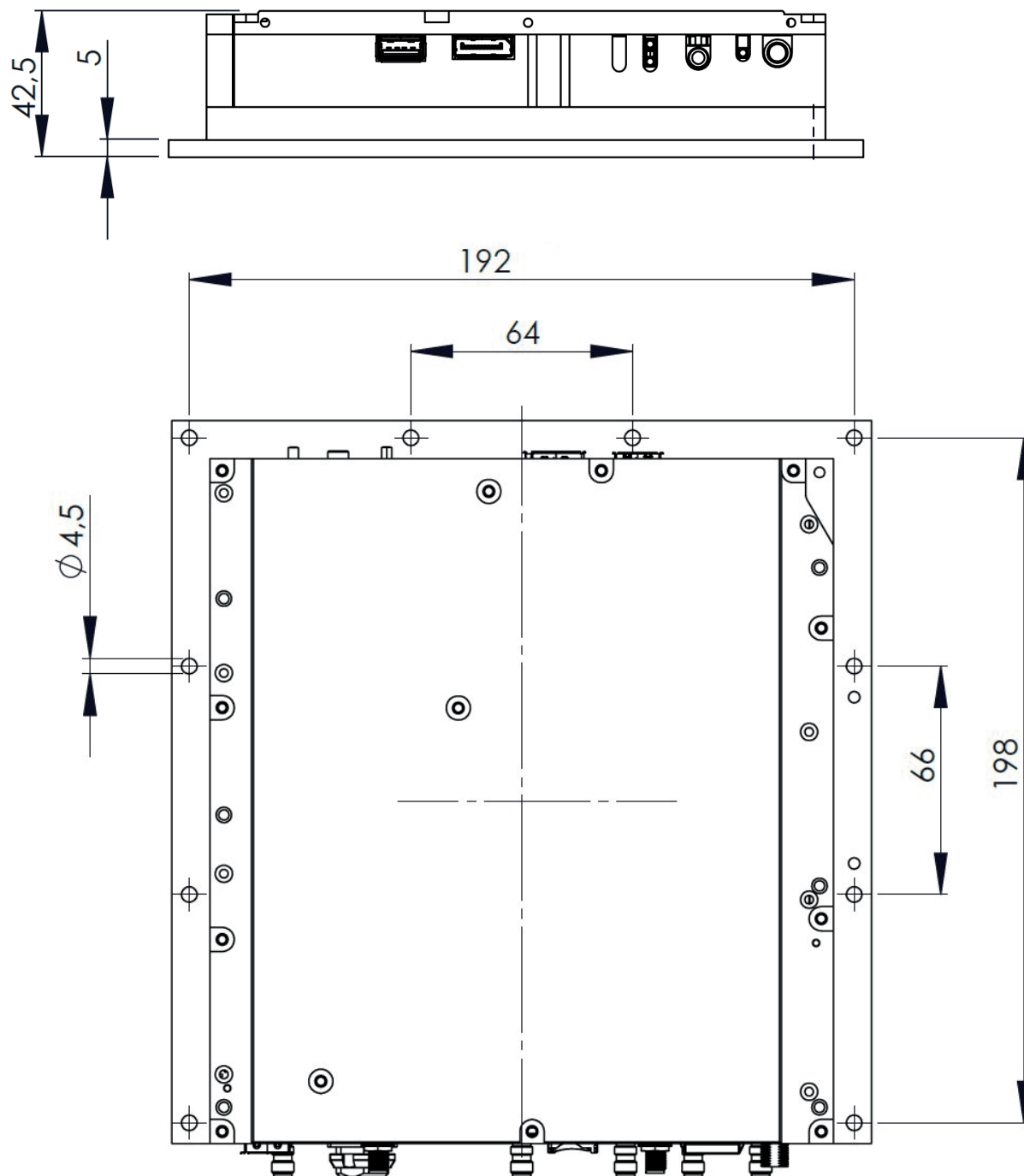
e   *Requires additional software*

Drawing - SignalShark 3340/101
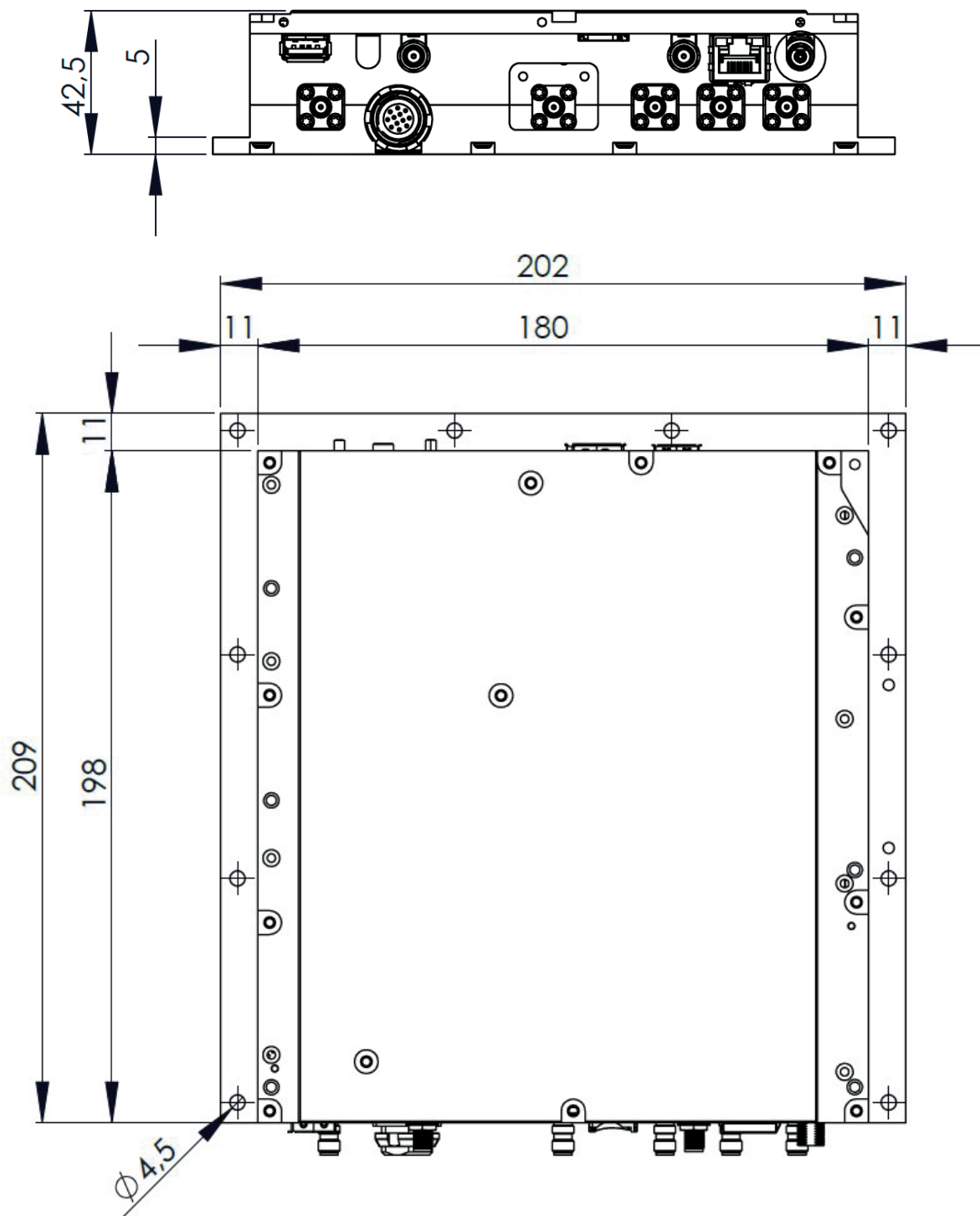
All dimensions are given in mm.

Drawing - SignalShark 3340/101

All dimensions are given in mm.

Installation requirements

Heat sink

For a sufficient heat dissipation and to be able to stay below the specified internal maximum temperatures of + 83 °C for the mainboard/RF-board and + 104 °C for the FPGA when the DF receiver module is operated at the specified maximum operating temperature of 55 °C (see Specifications "Operating temperature" on page 13), an additional thermal resistance of 0.72 K/W is required (see Specifications "Heat dissipation" on page 13). Therefore a heat sink with a thermal resistance of 0.72 K/W must be brought onto the DF receiver module mounted with a sufficient contact pressure over the whole surface.

It is recommend to use the supplied thermal pads, but it is also possible to use a thin layer of thermal paste.

Note that it is not recommended to operate the DF receiver module at the specified maximum temperatures for long periods of time.

*Be aware that **the user is at all times responsible** for ensuring a constant and sufficient heat dissipation.*

Further information

Consider allowing enough space for the connectors on the DF receiver module unit as well as the antenna control surge arrester when installing the DF receiver module in a customer housing/enclosure, in a rack, next to other devices etc.. At least 10 cm on connector side for the antenna control connector is needed.

Remember to also keep a certain distance to enable efficient heat dissipation.

Further information, such as the in the delivery included leaflet Installation requirements as well as 3D data (shape files) for customized designs, can be found at www.narda-sts.com under Downloads.
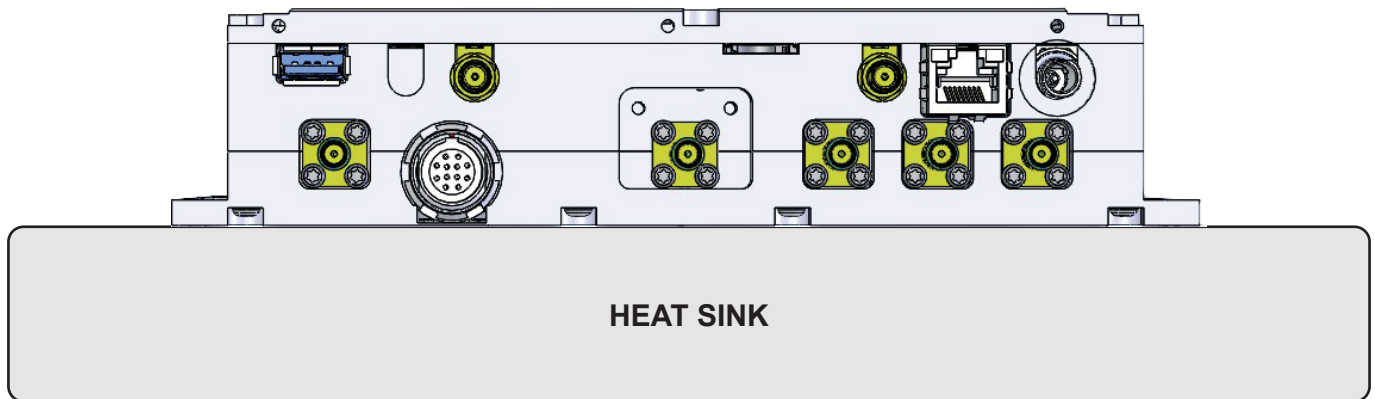

HEAT SINK

Fig. 2.   Principle drawing of SignalShark DF Receiver Module mounted on a heat sink.

Ordering Information

The SignalShark DF Receiver Module is included in the Basic Sets. Application Packages as well as Software Options and Accessories that provide additional signal analysis capabilities are also available.

Your local Narda sales representative can provide information about all the possible options and will be pleased to offer advice.

Basic Unit Sets

SignalShark DF Receiver Module	Part number
The Basic set contains the SignalShark DF Receiver Module as well as basic accessories and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions. **Includes:** › SignalShark DF Receiver Module 3340/01 › Antenna Control Surge Arrester › Cable for Antenna Control Surge Arrester › Power Supply 12VDC, 5.5A, 100V-240VAC, screw plug* › Ferrite clamp filter › 4x Thermal pad 50 mm x 50 mm x 0.5 mm › 40 MHz real-time Spectrum, Marker and Peak Table › Option, SCPI Remote Control › USB Stick: SW and Manuals, ordered options › Electronic manual (English) › Safety Instructions › SignalShark 3320 - Quick Start Guide	**3340/101**

*Please choose Power Cord 2260/90.65 -.69

Application Packages

The application packages make it easy to adapt SignalShark to your requirements. Each package typically consists of application-dependent hardware accessories and/or firmware options, and costs less than purchasing the items individually. Additional packages can be purchased as and when required.

Your local Narda sales representative will be happy to assist you in the selection of the right packages for your applications.

App. Package, Receiver	Part number
The Receiver Application Package guarantees situational awareness by providing gapless analysis of entire signal bands. It also enables demodulation of AM, FM, LSB, USB, and CW signals. **Includes:** › Option, Spectrogram (3310/95.002) › Option, Level Meter incl. Compass values (3310/95.003) › Option, Analog Demodulation (3310/95.007)	**3310/94.01**

App. Package, Direction Finding Basic	Part number
This Application Package provides comprehensive functions to support hunting of interference signals and hidden transmitters. The device based GPS and the antenna handle with built-in electronic compass makes it possible to conveniently take bearings on a transmitter from various locations. **Includes:** › Active Antenna Handle for SignalShark, 8 kHz to 8 GHz (3300/10) › Arm Support for Active Antenna Handle (3100/90.10) › Option, Mapping and Localization (3310/95.006) › Option, Horizontal Scan (3310/95.011)	**3310/94.02**

App. Package, Automatic DF 2, 10 MHz to 8 GHz *	Part number
This Application Package provides basic equipment and options for vehicle based, automatic direction finding (bearing). **Includes:** › Automatic DF-Antenna 2 (3361/01) › USB Stick: Software and Manuals, ordered Options (3310/93.01) › RF-Cable, DC to 8 GHz, N to SMA, 50 Ohm, 5 m (3603/02) › Option, Automatic DF Antenna Control, Bearing View (3310/95.005) › Tool, Allen Wrench 3 mm (3300/90.19) › ADFA Vehicle Mounting Kit for autom. DF Antenna (3300/90.04) incl. the "Automatic DF-Antenna Handling and Safety Instructions" multilingual (3360/98.12) › Shipping Carton with Inlet for autom. DF-Antenna	**3310/94.06**

*Additional option 3310/95.006 "Mapping and Localization" is recommended for Open Street Map based visualization and heat-map localization.

App. Package, Automatic DF 2, 10 MHz to 8 GHz, Hardcase *	Part number
This Application Package provides basic equipment and options for vehicle based, automatic direction finding (bearing). **Includes:** › Automatic DF-Antenna 2 (3361/01) › USB Stick: Software and Manuals, ordered Options (3310/93.01) › RF-Cable, DC to 8 GHz, N to SMA, 50 Ohm, 5 m (3603/02) › Option, Automatic DF Antenna Control, Bearing View (3310/95.005) › Tool, Allen Wrench 3 mm (3300/90.19) › ADFA Vehicle Mounting Kit for autom. DF Antenna (3300/90.04) incl. the "Automatic DF-Antenna Handling and Safety Instructions" multilingual (3360/98.12) › Hardcase for Automatic DF Antenna (3360/90.01)	**3310/94.12**

*Additional option 3310/95.006 "Mapping and Localization" is recommended for Open Street Map based visualization and heat-map localization

Software Options

Software options allows the adaption of the device feature set to your needs.

Description	Part number
40 MHz real-time Spectrum, Marker and Peak Table (included in SignalShark 3320 Basic Set). Via the "*Spectrum (Scan)*"-, "*RT (Real-Time) Spectrum*"- "*Auto DF*"-, and "*IQ Analyzer*"-Tasks, the following View(s) can be accessed: › Spectrum View › Peak Table (of Spectrum) View	**Included in Basic Set**
Option, Spectrogram Via the "*Spectrum (Scan)*"- and "*RT (Real-Time) Spectrum*"-Tasks, the following View(s) can be accessed: › Spectrogram View	**3310/95.002**
Option, Level Meter incl. Compass values Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Level Meter View	**3310/95.003**
Option, Persistence (of real-time Spectrum) Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Persistence View	**3310/95.004**
Option, Automatic DF Antenna Control, Bearing View Via the "*Auto DF*"-Task, the following View(s) can be accessed: › Bearing View	**3310/95.005**
Option, Mapping and Localization Via the "*Spectrum (Scan)*"-, "*RT (Real-Time) Spectrum*"-, and "*Auto DF*"-Tasks, the following View(s) can be accessed: › Map View	**3310/95.006**
Option, Analog Demodulation Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Spectrum View › Level meter View	**3310/95.007**
Option, Horizontal Scan Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Horizontal Scan View	**3310/95.011**
Option, SCPI Remote Control (included in SignalShark 3320 Basic Set)	**3310/95.12** **Included in Basic Set**
Option, VITA 49[f] Via the "*RT Streaming*"-Task, the following View(s) can be accessed: › VITA 49 FFT Streaming View › VITA 49 IQ Streaming View	**3310/95.014**
Option, IQ Analyzer, Recorder, Trigger, Magn. View Via the "*IQ Analyzer*"-Task, the following View(s) can be accessed: › IQ Magnitude View › IQ Spectrum View › IQ Spectrogram View	**3310/95.018**

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f   *Requires Option 3310/95.012 "Option, SCPI Remote Control"*

Accessories

Accessory Description	Part number
Power Supply 12VDC, 5.5A, 100V-240VAC, Locking Power Plug S10KS17, choose Power Cord 2260/90.65 -.69 (included in SignalShark 3320 Basic Set)	2259/92.10
Power Supply DC Vehicle Adapter, screw plug	2259/92.12
External GNSS Antenna, active	3300/90.05
RF Adapter, N Male to SMA Female, 50 Ohm	3300/90.13
Headphone, 3.5mm Plug for SignalShark	3300/90.14
Recovery media for SignalShark Quad Core	3310/90.25
RF and Control-Cable for Automatic DF-antennas, DC to 8 GHz, N to SMA, 50 Ohm, 5 m	3603/02
RF and Control-Cable for Automatic DF-antennas, DC to 8 GHz, N to SMA, 50 Ohm, 15 m	3603/03
RF and Control-Cable for Automatic DF-antennas, DC to 8 GHz, N to SMA, 50 Ohm, 10 m	3603/07
Tripod, Non-Conductive, 1.65m, reinforced, 3/8"-16 UNC (for ADFA 2 only)	3300/90.16
Tripod Quick-Release Coupling, 3/8"-16 UNC (for 3300/90.16)	3300/90.17
ADFA Non-Conductive Antenna Mast Mounting Kit	3300/90.23
Tripod, Non-Conductive, 1.65 m, 1/4", with Carrying Bag	2244/90.31
Spanner Tool for ODU Nut	3340/90.03

Antennas*	Part number
Automatic DF-Antenna 2 Basic Set, 10 MHz to 8 GHz[g]	3361/101

*There is a separate DF antenna datasheet, which provides detailed information about the direction-finding antennas available from Narda.

g   Requires Option 3310/95.005 "Option, Automatic DF Antenna Control, Bearing View"

SignalShark Family

There are several different instrument types in the SignalShark family:
SignalShark Handheld, SignalShark Remote Unit, SignalShark Outdoor Unit Modem R[n] Basic Set and SignalShark EMF Monitoring System, R[n].
For more information, please visit our website www.narda-sts.com
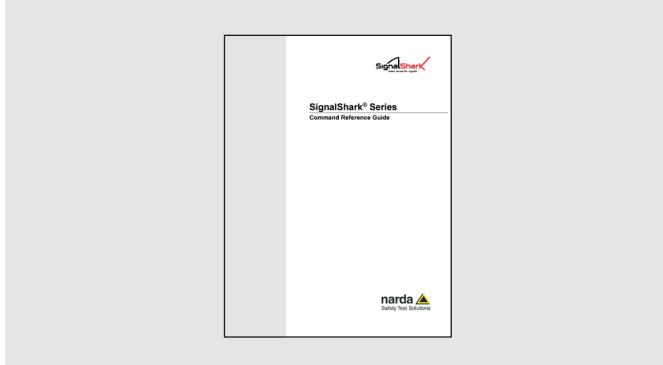
SignalShark Handheld	SignalShark Remote Unit

SignalShark Outdoor Unit	SignalShark EMF

Narda DF Antennas Datasheet	SignalShark Command Reference Guide

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