



## HF Transmit/Receive Broadband System R&S®XB 2900

*Especially designed for naval operational environment*

- ◆ Full HF frequency band (2 MHz to 30 MHz) for voice, data, and ALE operation
- ◆ Flexible system configuration from 2 to 32 lines in steps of 1
- ◆ Very low levels of intermodulation
- ◆ Very high flexibility with regard to system configuration and power management
- ◆ High system reliability and MTBF figures
- ◆ Extensive BITE and continuous monitoring facilities
- ◆ Exciter/receiver sections with optional plug-in modules for:
  - ALE operation
  - Fast data transmission
  - Pre-/post-selection
  - Digital speech processing
  - Automatic phone patch
- ◆ Full integration into a central remote control system
- ◆ Common tried-and-tested standard components for narrowband and wideband systems
- ◆ Compact system design
- ◆ Max. output power 4 kW



**ROHDE & SCHWARZ**

# HF Transmit/Receive Broadband System R&S®XB 2900

## At a glance

The HF Transmit/Receive Broadband System R&S®XB 2900 is a modern and high-performance communications system especially designed for the naval operational environment. The R&S®XB 2900 is used by various NATO navies.

The R&S®XB 2900 is based on the idea of combining the ship's various HF transmission signals at the high power level and using only one broadband antenna system.

The system provides independent operational circuits in any available transmission mode such as the following:

- ◆ Voice
- ◆ RATT
- ◆ High speed data
- ◆ Data Link 11/22 (FF)
- ◆ Automatic link establishment (ALE), etc

## Functionality

The HF Transmit/Receive Broadband System R&S®XB 2900 operates in the frequency range 2 MHz to 30 MHz (RX down to 10 kHz) with an antenna system consisting of two or three broadband antennas. The frequency spacing between the transmit channels can be reduced to about 1% separation.

The power management system provides a wide variety of RF power levels for the output signals by combining several lines up to 4 kW and more (P<sup>3</sup>).

The RF highpower signals are combined in highly linear 3 dB coupler units, so that there are no active switching elements at the high power levels.

The configuration of the system is based on standard Rohde & Schwarz components such as the following:

- ◆ Transceivers R&S®XK 2900L
- ◆ Power Management Unit (PMU) R&S®GV 2900
- ◆ Power Combiners R&S®FK 2910 and R&S®FK 2920, 2 kW and 4 kW
- ◆ Load Resistors R&S®RBS 1000
- ◆ Triplexer R&S®FK 2950 and diplexer for broadband antenna system (WBL, WBM, WBH)

The R&S®XB 2900 is able to handle the following transceiver operating modes:

- ◆ Embedded fast data Modem with waveforms such as
  - MIL-STD-188-110A
  - MIL STD-188-110B, App. C
  - STANAG 4285
  - STANAG 4529
- ◆ Data link operation e.g.:
  - LINK 11 (CLEW)
  - LINK 11 (SLEW)
  - LINK 22 (FF)
  - LINK Y (Mk II)
- ◆ Automatic link establishment in line with FED STD 1045/1046/1049



*The R&S®XB 2900 broadband system (in operation on a frigate)*

## Tailored to your specific requirements

Using these standard components the system can be precisely configured to the number of lines and power requirements for each line needed, i.e. tailored to the actual operational requirement, e.g. 2 to 32 HF lines in steps of 1 in an HF broadband antenna system. Each HF broadband line is equipped with a Transceiver R&S®XL 2900L.

The HF receiver sections are connected to a separate receive antenna distribution system.

## RF distribution

RF output signals are routed via an antenna diplexer or triplexer to the broadband antenna system.

The frequency ranges of the different antenna ports overlap so that coverage of the entire HF frequency band is ensured.

The fact that output signals are transmitted by two antennas in slightly overlapping frequency ranges has no particular influence on the radiation pattern, since the overall ship superstructure determines the radiation characteristics of the antenna system.

## System control

The integration of the HF Transmit/Receive Broadband System R&S®XB 2900 into a remote control system provides control and monitoring from one control terminal for all operations of the overall ship communications system.

## Logistic aspects

A significant logistic advantage of both the broadband and narrowband systems is that all power amplifiers and exciters are components of the same transceiver type – the R&S®XK 2900. These identical transceivers provide extremely high system availability and reliability.

## Outstanding reliability and survivability

The RF power amplifier stages are based on MOSFET semiconductor technology providing very high linearity and very low RF noise figures.

The passive RF combining system, without active electronic elements at high power levels but with power management, results in a very high reliability and MTBF figure for the overall system and each individual communications line.

The total power consumption of the HF broadband system depends on the number of transmit lines actually in use and their respective output power.

Power amplifier stages that are not transmitting operate in idle mode, i.e. their power consumption is less than 250 W per amplifier.

All components are equipped with extensive continuous monitoring and BITE facilities that provide status information for the central control system and the front-panel displays of the individual units.

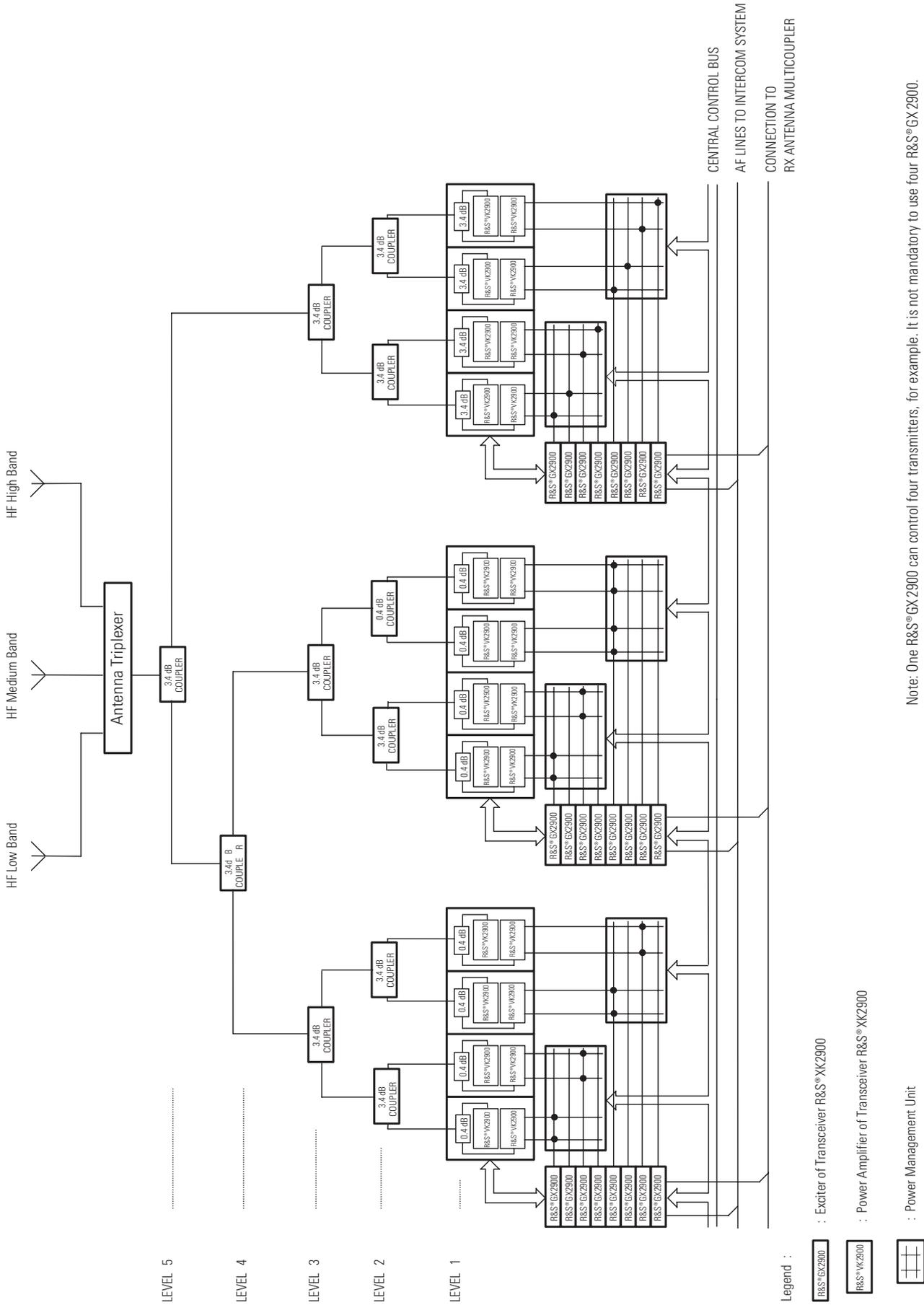
The system components can be changed easily and quickly without recalibration. Due to the compact design of the standard components the system can be installed in a minimum number of 19" standard racks.

## Summary

- ◆ Full HF frequency band (2 MHz to 30 MHz) for voice, data, and ALE operation
- ◆ Operating frequency separation of 1 %
- ◆ Very low levels of intermodulation
- ◆ Very high flexibility with regard to system configuration and power management
- ◆ High system reliability and MTBF figures
- ◆ Extensive BITE and continuous monitoring facilities
- ◆ Exciter/receiver sections with optional plug-in modules for:
  - ALE operation
  - Fast data transmission
  - Pre-/post-selection
  - Digital speech processing
  - Automatic phone patch
- ◆ High efficiency through optimum use of power amplifier stages
- ◆ Full integration into a central remote control system
- ◆ Common tried-and-tested standard components for narrowband and wideband systems

The use of the HF Transmit/Receive Broadband System R&S®XB 2900 is not limited to naval applications, but is also very effective in stationary scenarios.

# Typical solution for a HF broadband transmit/receive system



## Specifications

### Power Combiner R&S®FK2910 (2 kW)

Frequency range	2 MHz to 30 MHz
Power handling	max. 1122 W, decoupled max. 2150 W, coupled
Passband attenuation	0.4 dB, typ. 0.2 dB
Input/output impedance	$Z = 50 \Omega$ (in passband range at termination with $Z_0 = 50 \Omega$ )
RF inputs/RF outputs	coaxial socket, type N
Design	19" slide-in unit, 3 height units
Dimensions (D × W × H)	460 mm × 482 mm × 132 mm
Weight	10.2 kg
Color	front panel: RAL 7035, semi-matt
MTBF	390 000 h
MTTR	0.5 h

### Power Combiner R&S®FK2920 (4 kW)

Frequency range	2 MHz to 30 MHz
Power handling	max. 4100 W, decoupled max. 2150 W, coupled
Passband attenuation	0.4 dB, typ. 0.2 dB
Input impedance	$Z = 50 \Omega$ (in passband range at termination with $Z_0 = 50 \Omega$ )
Return loss	23.5 dB, load resistance at all other ports $50 \Omega$
Output impedance	nominally $Z_0 = 50 \Omega$
RF inputs/RF outputs	7/16 connector system
Design	19" slide-in unit, 5 height units
Dimensions (D × W × H)	460 mm × 482 mm × 221 mm
Weight	max. 17 kg
Color	front panel: RAL 7035, semi-matt
MTBF	390 000 h
MTTR	0.5 h

### Antenna Triplexer R&S®FK2950 (example)

Frequency range	2 MHz to 30 MHz
Passband range	
WBL (wideband low), lowpass	on request
WBM (wideband medium), bandpass	on request
WBH (wideband high), highpass	on request
Passband attenuation	<0.4 dB, typ. 0.25 dB
Stopband attenuation	
WBL	$1.3 \times f_0$ : 40 dB
WBM	$f_0/1.3$ : 40 dB; $f_0 \times 1.3$ : 40 dB
WBH	$f_0/1.3$ : 40 dB; $f_0 \times 1.3$ : 40 dB
Input impedance	$Z = 50 \Omega$ , VSWR <1.28 in passband range at termination with $Z_0 = 50 \Omega$
Output impedance	nominally $Z_0 = 50 \Omega$

Mechanical data	
RF input/RF outputs	coaxial socket, 7/16 connector system
Design	19" slide-in unit, 7 height units
Dimensions	depth 565 mm (measured from front panel, including connectors)
Weight	48 kg
Color	front panel: RAL 7035, semi-matt; case: aluminium, chrome finish
MTBF	150 000 h
MTTR	0.5 h

### Power Management Unit R&S®GV2900 (PMU)

Operating modes	
Single-line mode	each R&S®VK2900 amplifier is allocated to a single R&S®GX2900 exciter
2 kW mode	two R&S®VK2900 power amplifiers are driven by the same exciter signal, i.e. Nos. 1 & 2 and Nos. 3 & 4
4 kW mode	all four R&S®VK2900 amplifiers are coherently driven by the same exciter signal
Mixed mode	one exciter unit controls two power amplifiers, i.e. coherent driving two exciters operate on independent lines and one exciter remains free for receiver operation
Mode switching time	<3 s
HF data	
Frequency range	TX: 2 MHz to 30 MHz RX: 10 kHz to 30 MHz
Intermodulation – output signals ( $P_m = 7$ dB PEP)	>50 dB referenced to single tone
Decoupling, single lines	>40 dB
Harmonic suppression ( $P_m = 7$ dBm CW)	>40 dB

### Environmental data (valid for all components)

Operating temperature	–25 °C to +55 °C
Storage temperature	–40 °C to +85 °C
Altitude	3 000 m above sea level, T = 35 °C
Humidity	26 °C/41 °C, 95%, 5 days MIL-STD-810-E, method 507.3 with slight condensation
Vibration	DIN IEC 60068-2-6
Random	DIN IEC 60068-2-64, equipment class B
Shock	MIL-STD-810-E, method 516.4
Protection	DIN 40050, IP20
EMC	MIL-STD-461-C, class 4 (CE03, RE02, RS03), EN 300339
Noise level	<55 dBA at a distance of 1 m

## Ordering information

Designation	Type	Order No.
HF Transceiver, 1 kW, installed in a 19" rack	R&S®XK2900L	6057.9992.12
HF Transceiver, 1 kW, installed in a 19" rack with selective level control (option)	R&S®XK2900L	6057.9992.13
Digitally Tuned RF Selection 40 dB (mandatory option)	R&S®FK2040	6096.9902.02
Power Management Unit	R&S®GV2900	6077.3519.02
Combiner 2 kW	R&S®FK2910	6077.8510.02
Combiner 4 kW	R&S®FK2920	6090.0003.02
Load Resistor (1 kW)	R&S®RBS1000	0207.4010.55
Load Resistor (2 kW, 5 kW)		on request
Triplexer	R&S®FK2950	6090.3502.02
Diplexer		6096.7051.00

More information at  
[www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
 (search term: XB2900)



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