

DAB Transmitter Family R&S NA/NL 6000

Compact digital audio broadcast transmitters

- ◆ DAB transmitters for VHF band III (125 W to 2000 W) and L band (100 W to 750 W)
- ◆ Seamless switching of ETI input without additional signal delay
- ◆ Maximum reliability through use of DMOS/LDMOS transistors, advanced (patented) power coupler and circulators
- ◆ Small footprint – compact 19" standard rack, 800 mm deep
- ◆ Bandpass filter accommodated in transmitter rack
- ◆ Integrated COFDM modulator for ETI(NI) or ETI(NA) input signals
- ◆ Integrated GPS receiver
- ◆ Full redundancy of all main components (exciter, amplifier, power supply, GPS receiver, fan) integrated in transmitter rack
- ◆ (n+1) standby configuration
- ◆ Hot-swappable modules and components
- ◆ Remote control via R&S Netlink (SNMP, HTTP) or GSM modem
- ◆ Input for external reference frequency for synchronization
- ◆ Ambient-air or forced-air cooling



1 kW transmitter for VHF band III

Digital audio – backed by a wealth of experience

The international digital audio broadcasting (DAB) standard (Eureka Project 147) enables the transmission of CD-quality radio programs with modern digital auxiliary services. This powerful platform of the future calls for efficient DAB transmitters.

Rohde&Schwarz – with more than 40 years of experience in broadcasting and transmitter technology – enters into the digital age of sound broadcasting with its DAB Transmitter Family R&S NA/NL6000. This new transmitter series is part of a wide range of digital and ana-

log sound and TV broadcast transmitters from Rohde&Schwarz. This means that our customers can rely on a solid and successful product base and benefit from the exacting quality standards of Rohde&Schwarz.

At a glance

For VHF band III, the transmitters of the R&S NA6000 family with output power between 125 W and 2000 W are available, covering the frequency ranges 175 MHz to 207 MHz (channels 5 to 8) and 207 MHz to 240 MHz (channels 9 to 13).

For the L band, the transmitters of the R&S NL6000 family with output power between 100 W and 750 W and frequency range from 1452 MHz to 1492 MHz are offered.

The very small footprint of the transmitters (depth of only 800 mm), in conjunction with plug-in modules of low height and a very high efficiency, makes for minimum space requirements and reduces operating costs drastically. Digital technology, combined with state-of-the-art components, allows economical use of resources.

All modules were designed and optimized for high reliability, compact size and maximum quality of the broadcast signal.

Main features

All transmitters are fully transistorized. D-MOSFET transistors are used for band III, and LDMOS components for the L band. One of the main objectives in transmitter design was conformance of the broadcast signal with the standard. The stipulated shoulder distances in the frequency spectrum are ensured even if commercial filters of other makes are used.

The internal circuitry and the transistors operate in a mode that ensures maximum reliability and temperature stability. A main point of emphasis was long life of the transistors at elevated ambient temperatures.

The bandpass filter can optionally be integrated in the transmitter rack for all power ratings. Band III is implemented with a 6-circuit output mask filter; for the L band, a 4-circuit filter developed by Rohde&Schwarz is used.

Each amplifier module is fed by a switching power supply of its own. Reliability is further enhanced by assigning a separate preamplifier to each amplifier module. This reduces the number of central components (single points of failure) to a minimum.

An optional GPS receiver can be added to the exciter with integrated COFDM modulator. The transmitter also operates in single-frequency networks (SFNs). It accepts both network-independent (NI, G.703) and network-adapted (NA, G.704) ETI signals. In addition, a selectable delay of up to 1000 ms can be introduced in the signal to be broadcast.

The exciter also generates a test sequence (pseudo random binary sequence, PRBS) for a subchannel.

For band III, the DAB output signal is generated by direct modulation; for the L band, an intermediate frequency is used. Digital precorrection is performed at the baseband, and a signal conforming to the ETS 300401 standard is output.

The patented PIN diode coupler employed in the band III transmitters minimizes power losses when several amplifiers are combined.

The advanced coupler concept reduces power loss in the event of an amplifier failure from 6 dB to 3.5 dB, i.e. power loss is nearly halved compared with conventional 3 dB couplers.

Due to the use of a circulator at the output of each power amplifier, the transmitter will continue to operate in the event of deterioration of the output matching up to a VSWR of 1.5. Moreover, the amplifiers are protected against damage from extreme mismatch including short-circuit and open-circuit conditions. The use of circulators results in the transmitter operating frequency range being split into two groups in band III. Changeover to the other frequency range is achieved simply by exchanging amplifier modules.

The cooling concept allows for air intake from above, below or behind, as well as forced-air or ambient-air cooling, as required by the customer.

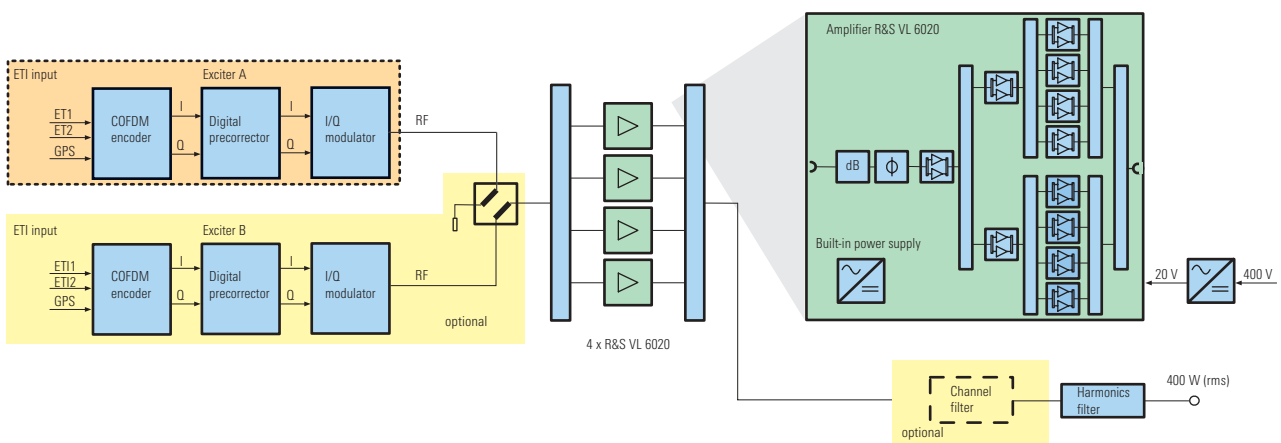
Configuration

The transmitter can be locally configured by means of an easy-to-operate graphical menu system.

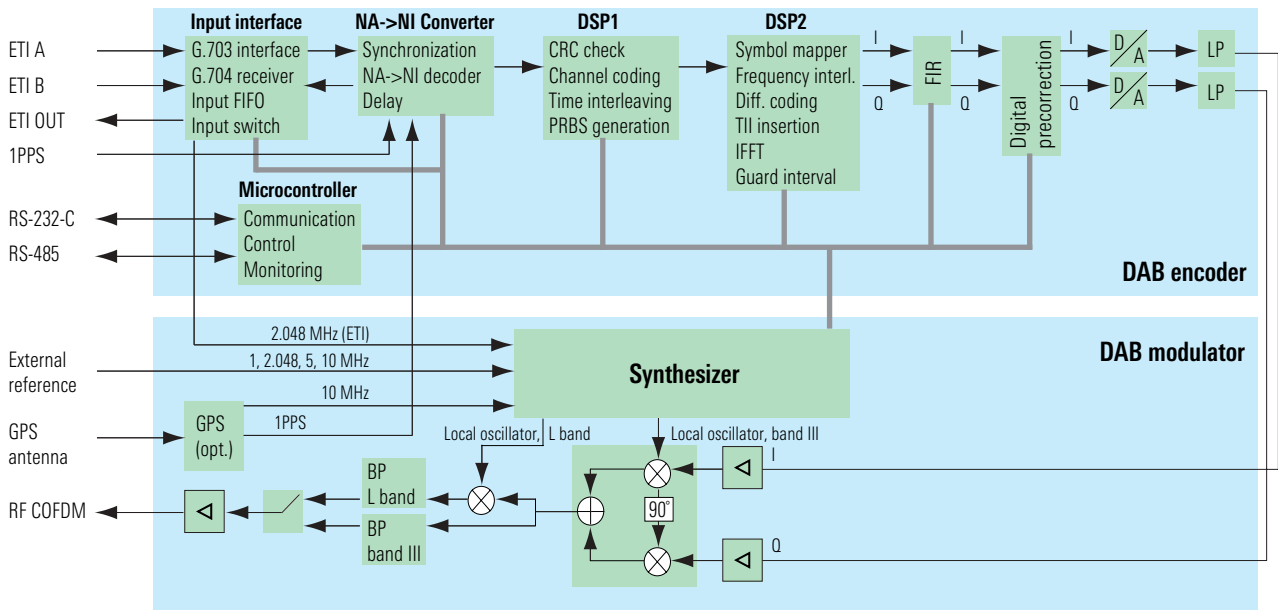
The transmitter can also be remotely controlled from a PC with a graphical user interface (GUI), optionally via a serial modem (RS-232-C), a bitbus interface (RS-485) or a parallel interface (relay contacts, TTL interface).

With the optional R&S Netlink management solution from Rohde&Schwarz, the transmitter can be configured, monitored and controlled via a modern web-based user interface. R&S Netlink even allows the transmitter to be integrated into an IP/SNMP-based network management system.

All setting parameters are stored in non-volatile memory, so that the configuration last active will be automatically restored after a failure.



Block diagram of 400 W L-band DAB Transmitter R&S NL6040P



Block diagram of DAB exciter

Monitoring functions

All transmitter functions are automatically monitored. Any failures or warnings are displayed and output to the remote control system.

The following parameters are monitored:

- ◆ ETI input signal for integrity and bit errors (CRC)
- ◆ Reference signals (1 pps) and GPS signal
- ◆ Power supply (for each phase voltage)
- ◆ RF output power
- ◆ Reflections at RF output
- ◆ Amplifier operating temperature
- ◆ Intake and outlet air temperature
- ◆ SFN function

Redundancy

The number of amplifier modules can be selected to provide the desired output power rating and redundancy while ensuring optimum space requirements.

A redundant amplifier and power supply concept also calls for a redundant cooling system. Two fans are therefore integrated in the transmitter rack.

The transmitters can be configured with a second DAB exciter and non-interrupting automatic switchover (exciter standby).

The two redundancy components are integrated in the transmitter rack.

The exciters can optionally be equipped with an uninterruptible power supply.

Moreover, passive or active standby as well as 1+1 or n+1 standby can be implemented.

The transmitter is equipped with two independent ETI inputs. If the active input fails, seamless switchover is made to the other input, i.e. signal switching does not involve any additional delay.

Maintenance

All transmitter components are installed in a 19" rack in a clear-cut arrangement. All modules and fans as well as the inactive exciter (in an exciter standby configuration) are hot-swappable. If an amplifier module fails, the transmitter continues to operate at reduced output power.

Modules can conveniently be replaced from the transmitter front.

Complementary products

Since all Rohde&Schwarz transmitter families are based on the same platform, higher-power products can also be implemented, e.g. the liquid-cooled high-power transmitters of the DAB Transmitter Family R&S NA7000.

The DAB Multiplexer R&S DM001 generates the ETI signal to be broadcast. Featuring up to 12 input channels and supporting STI functionality, the multiplexer combines the incoming digitized audio services to form the ensemble transport interface (ETI). To increase the availability of this central component in DAB systems, Rohde&Schwarz offers the DAB Redundancy Concept R&S DM001-R and the Professional Control Software R&S DM001-P with extended monitoring functions for the input and output signals.

Datacasting solutions based on the DSB Data Inserter R&S DSIP020, extended by software components such as WebCarousel™ R&S DTVCAR or DAB MOTstreamer R&S MOTCAR, allow data to be broadcast as non-program associated data (NPAD). In addition, IP-based streaming media (MP3, MPEG-4 video) can be transmitted via DAB.



Specifications

	R&S NA6013	R&S NA6025	R&S NA6050	R&S NA6100	R&S NA6200	R&S NL6010	R&S NL6020	R&S NL6040	R&S NL6075
Frequency range	band III, 175 MHz to 207 MHz	207 MHz, 207 MHz to 240 MHz	207 MHz to 240 MHz	207 MHz to 240 MHz	L band, 1452 MHz to 1492 MHz				
RF output power (rms) after mask filter	125 W	250 W	500 W	1000 W	2000 W	100 W	200 W	400 W	750 W
RF power of plug-in modules	1 x 125 W	1 x 250 W/2 x 125 W	2 x 250 W	4 x 250 W	8 x 250 W	1 x 100 W	1 x 200 W/2 x 100 W	2 x 200 W/4 x 100 W	4 x 200 W
Permissible VSWR	circulators at output of power amplifiers, switch-off at VSWR > 1.5								
RF output connector	7/16 female								
Power supply	3 x 400 V AC ± 10%, three-phase operation								
Power consumption (approx.)	1.4 kW	2.5 kW	4.3 kW	7.8 kW	15.5 kW	1.35 kW	2.5 kW	4.2 kW	7.7 kW
Fusing (3-phase)	3 x 6 A	3 x 10 A	3 x 16 A	3 x 16 A	2 x (3 x 16 A)	3 x 6 A	3 x 10 A	3 x 16 A	3 x 16 A
Ambient temperature	1°C to 40°C								
Cooling air inlet temperature	0°C to 40°C								
Air flow rate	5 m³/min	5 m³/min	10 m³/min	20 m³/min	40 m³/min	5 m³/min	5 m³/min	10 m³/min	20 m³/min
Installation altitude	up to 2000 m above sea level (fans for higher altitudes available as options)								
EMC	to ETS 300447								
Dimensions (W x H x D)	582 mm x 2034 mm x 800 mm (2000 W, two racks)								
Weight (approx.)	220 kg	240 kg/260 kg	280 kg	360 kg	720 kg	240 kg	260 kg/280 kg	300 kg/340 kg	380 kg

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Transmission characteristics									
DAB modes	I, II, III, IV								
Modulation input	XLR female 120 Ω (standard) and BNC female 75 Ω (adapter) for ETI (NI, G.703) and ETI (NA, G.704), automatic switchover								
Precorrection	digital, after IFFT and FIR filter								
IF	no IF, direct modulation								
Frequency stability	better than 1×10^{-9} with GPS, after loss of GPS better than 1×10^{-7} for period of 24 hours								
Frequency response, DAB block	< 1 dB								
Output spectrum after mask filter	critical mask to ETS 300447								
Output spectrum without mask filter	precorrected >35 dB (>38 dB typ.)								
Output filter	integrated in rack								
Static delay compensation	max. 1 s, in steps of 488 ns								
Dynamic delay compensation	max. 1 s, in steps of 488 ns								
Interfaces									
RS-232-C	transmitter configuration via front panel from external computer								
RS-485/bitbus	remote-control interface (software)								
Parallel	optional remote-control interface (relays, TTL)								
SNMP/HTTP	optionally via R&S Netlink								
External reference frequency input	1/2.048/5/10 MHz, 1 pps								
Test points	ETI input, RF exciter, RF output of each amplifier, transmitter RF output after filter								

Ordering information

Frequency range	207 MHz to 240 MHz								
Order No.	2080.7500.02	2080.7500.03/13	2080.7500.04	2080.7500.05	2080.7500.06	2081.4504.02	2081.4504.03/13	2081.4504.04/14	2081.4504.05
Frequency range	175 MHz to 207 MHz								
Order No.	2080.7500.22	2080.7500.23/13	2080.7500.24	2080.7500.25	2080.7500.26				

