



Version
01.00

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DAB Test Transmitter R&S[®] SDB 601

Digital audio signals in laboratory and production

- ◆ Two inputs for ETI(NI) or ETI(NA) signals
- ◆ Input for external frequency synchronization
- ◆ Two DAB RF outputs
- ◆ Analog I/Q signals from COFDM modulator for external DAB channel simulation
- ◆ Integral GPS receiver (optional)
- ◆ PRBS sequence for BER measurements



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Overview

The R&S SDB601 generates DAB-T (terrestrial digital audio broadcasting) RF signals according to ETS EN300401 in band III (174 MHz to 240 MHz) and in the L band (1.452 GHz to 1.492 GHz). The instrument has been developed for measurements and tests in laboratory and production environments. It provides all kinds of DAB RF signals to be applied to DUTs via wireline.

Main components of the test transmitter:

- ◆ Encoder
- ◆ COFDM modulator
- ◆ Motherboard
- ◆ Power supply unit
- ◆ GPS receiver (optional)

ETI inputs

The input signal of the DAB test transmitter is an ETI(NI, G.703) or ETI(NA, G.704) signal. The type of signal applied is automatically detected. Two physical inputs are provided (main and standby path). An input FIFO is used to compensate for clock variations of the input signal relative to the reference clock.

The ETI signal transports data channels that can be used for configuration (TII: transmitter identification information, static delay, etc) of the transmitter network at the NA layer (NASC: network adapter service channel) as well as at the NI layer (MNSC: multiplex network service channel). This data is extracted from the data stream and automatically processed in the R&S SDB601. The extraction of configuration information and detection of dynamic reconfigurations are followed by error correction coding and time interleaving.

PRBS sequence

For test purposes, PRBS (pseudo random binary sequence) signals can be inserted into a subchannel. After the transmission frame has been formed, the DAB time signal is generated by an IFFT (inverse fast Fourier transform) calculation. The desired TII pattern and the guard interval are then added. The digital precorrector is able to correct the amplitude and phase of the signal and to influence the frequency response.

RF output signal

The signal is then directly modulated and converted to band III (without IF). For output in the L band, the signal is upconverted to the L band. The output signal is a modulated DAB RF signal to ETS EN300401 which is available simultaneously at the RF1 and the RF monitoring output. The signal level at the RF output is adjustable between 0 dBm and 8 dBm. The level at the RF monitoring output is between -3 dBm and +5 dBm; a value of 0 dBm is factory-set. The R&S SDB601 uses an external reference frequency (1 MHz, 2.048 MHz, 5 MHz or 10 MHz), the 2.048 MHz clock of the ETI signal or a reference value for the internal VCXO for synchronization. The optionally integrated GPS receiver can also be used.

I/Q output signal

Two outputs are provided for the analog I and Q signals. When a signal generator from Rohde&Schwarz, e.g. the R&S SMIQ, R&S SFQ, R&S SFL or R&S SMV, is used in addition, noise, level variations, fading or other effects can be produced for simulating real transmission channels.

Delay compensation

The time stamps in the signal are evaluated and used to control delay compensation (up to 1 s). If the dynamic delay is active, a static transmitter delay of up to 500 ms can be set in addition. The minimum delay depends on the selected operating mode and corresponds to the processing time of the R&S SDB601.

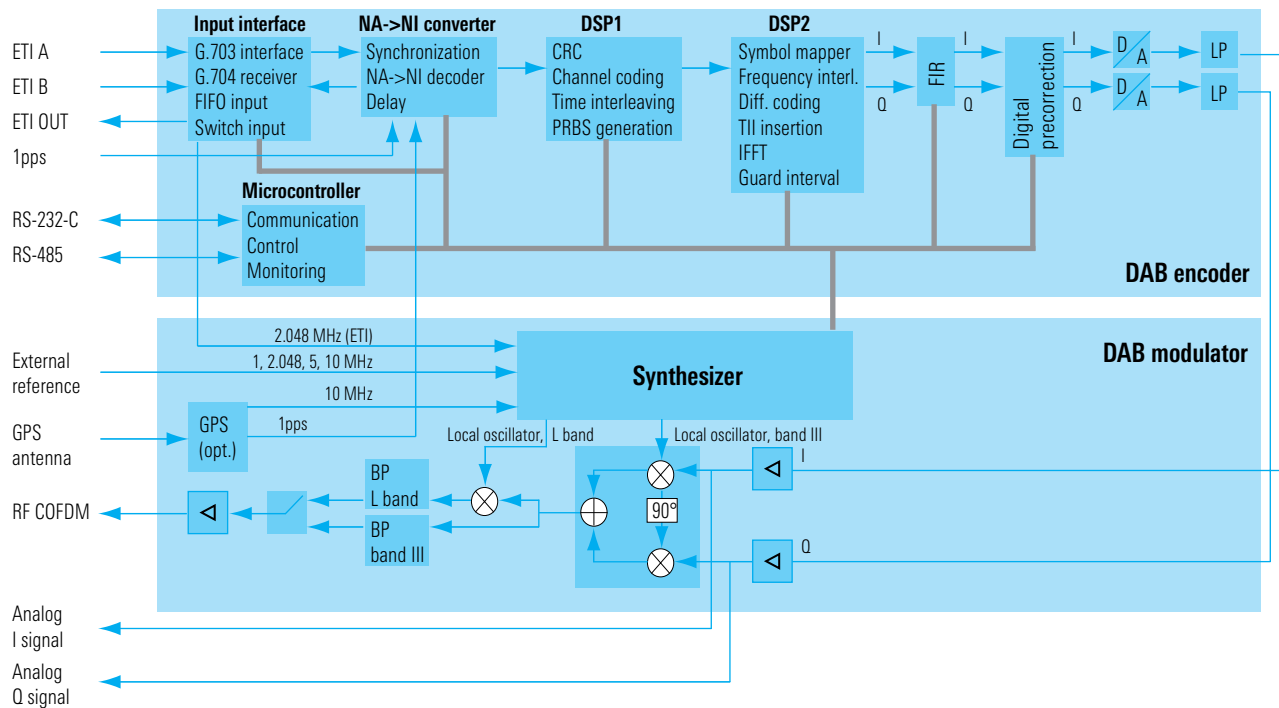
If the dynamic delay is off, an additional static delay (0 s to 500 ms) can be set independently for each of the ETI inputs in addition to the static delay of the transmitter.

A 1pps pulse is required for dynamic delay pre-correction. The 1pps pulse is applied to the 1pps input by the internal GPS receiver option or obtained from an external GPS receiver.

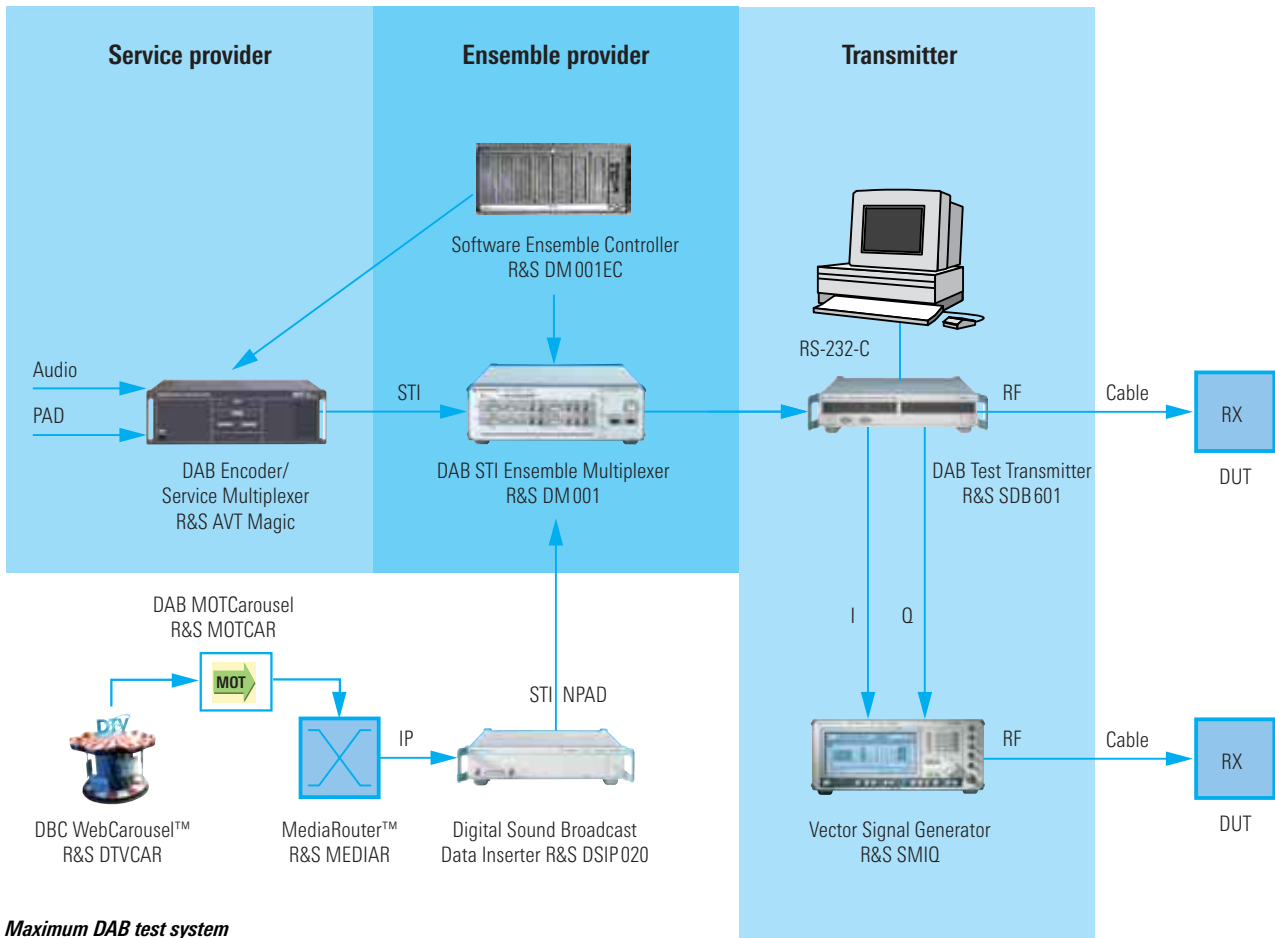
Operation

The R&S SDB601 is operated by special Windows PC software (GUI). The remote PC is connected to a serial interface (RS-232-C).

Block diagram of COFDM modulator



Simulation of DAB systems



Maximum DAB test system

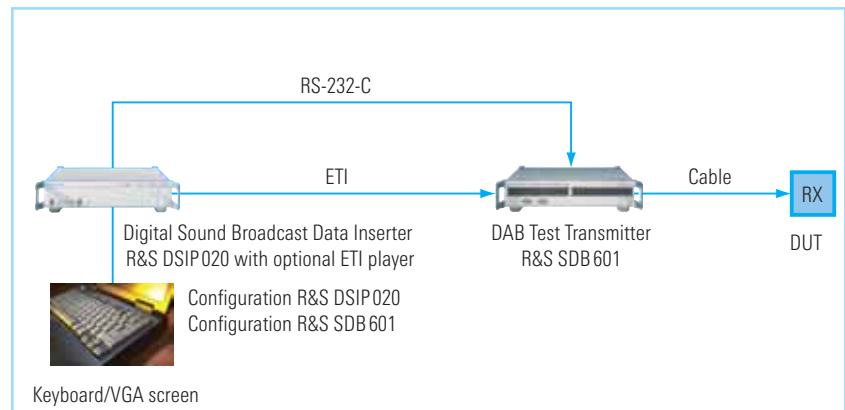
Application

To perform tests and measurements, the DAB Test Transmitter R&S SDB601 is combined with signal generators from Rohde&Schwarz, e.g. the R&S SMIQ, R&S SFQ or R&S SFL.

The R&S SMIQ has the following capabilities:

- ◆ Adding noise to the signal
- ◆ Channel simulation
- ◆ BER measurements
- ◆ Extended and calibrated level range

The Digital Sound Broadcast Data Inserter R&S DSIP020 can be used as an ETI baseband source. It allows all DAB services to be simulated.



Minimum DAB test system

Specifications

ETI signals	
ETI1, ETI2 input	ETI(NA, G.704) ₅₅₉₂ , ETI(NA, G.704) ₆₃₇₆ or ETI(NI, G.703) to ETS 300799, BNC, 75 Ω or 120 Ω
ETI monitoring output	BNC, 75 Ω, software-selectable source: – input signal after clock regeneration – input signal after NA->NI conversion and delay compensation
RF signals	
RF output	DAB RF signal, BNC, 50 Ω, 0 dBm to 8 dBm shoulder distance >45 dB at 4 dBm, 200 MHz center frequency shoulder distance >40 dB at 4 dBm, 1.472 GHz center frequency
RF monitoring output	DAB RF signal, BNC, 50 Ω, -3 dBm to +5 dBm shoulder distance >45 dB at 0 dBm, 200 MHz center frequency shoulder distance >38 dB at 0 dBm, 1.472 GHz center frequency
Baseband signals	
I/Q output	DAB baseband signal, analog, BNC, 50 Ω, 0 dBm ±0.2 dB (±1 V V _p into 1 kΩ) shoulder distance >45 dB at f >968 kHz ripple <1 dB
Reference signals	
External reference input	1/2.048/5/10 MHz, software-selectable, BNC, 50 Ω, 0 dBm to 16 dBm
10 MHz monitoring output	10 MHz, BNC, 50 Ω, >0 dBm
1pps input	2 V to 5 V, BNC, high impedance
GPS antenna input	BNC, 5 V operating voltage
Control interface	
Remote control	RS-232-C connector, female, via GUI from a PC
RF characteristics	
Frequency range Band III L band	174 MHz to 240 MHz, 1.452 GHz to 1.492 GHz, step width 16 kHz

Frequency stability	<1 × 10 ⁻⁷ /year, with internal 10 MHz reference only <3 × 10 ⁻¹² /day, GPS settled (option: epsilon board) <2 × 10 ⁻¹⁰ /day, GPS unsettled (option: R&S SDB-B20)
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DAB transmission parameters

DAB mode	I, II, III, IV				
Precorrection for amplitude and phase	digital, after IFFT and FIR filter				
TII	TII transmission acc. to signalling in ETI				
Delay compensation	max. 1 s dynamic delay, max. 1 s static delay, 488 ns step width				
Processing time Dynamic delay: ON, FIFO: ON/OFF	ETI(NI)	ETI(NA)			
			Mode 1	<121 ms	<121 ms
			Mode 2	<49 ms	<49 ms
			Mode 3	<49 ms	<49 ms
	Mode 4	<73 ms	<73 ms		
	Dynamic delay: OFF, FIFO: ON	Mode 1	<145 ms	<169 ms	
		Mode 2	<73 ms	<97 ms	
		Mode 3	<73 ms	<97 ms	
		Mode 4	<97 ms	<121 ms	
	Dynamic delay: OFF, FIFO: OFF	Mode 1	<145 ms	<169 ms	
		Mode 2	<73 ms	<97 ms	
		Mode 3	<73 ms	<97 ms	
Mode 4		<97 ms	<121 ms		
Synchronization	software-selectable clock: – internal GPS receiver (optional) – 2.048 MHz ETI input clock – 1/2.048/5/10 MHz external reference				

Test signals

PRBS	insertion into one of 64 subchannels, sequences software-selectable: X ²⁰ + X ¹⁷ + 1 X ²³ + X ¹⁸ + 1 X ¹⁵ + X ¹⁴ + 1
Carrier	768 user-selectable carriers

General data

Operating temperature range	+1°C to +40°C
Storage temperature range	-40°C to +70°C
Maximum installation altitude	2000 m above sea level
Permissible rel. humidity	<95% at 26°C
EMC environment	class B for common use, class A for industrial use, according to EN 61326
Dimensions (W × H × D)	465 mm × 90 mm × 495 mm (19" cabinet, 2 HU), seated depth of plug-in: 425 mm
Weight	8.6 kg
Power supply	100 V to 127 V/2 A, 200 V to 240 V/1.2 A 50 Hz to 60 Hz, F1/F2: IEC 127-T3H/250 V
Harmonics in supply system	according to EN 61000-3-2
Electrical safety	according to EN 61010-1
Type approval	according to R&TTE directive 1999/5/EC not approved for operation as a transmitter

Ordering information

Designation	Type	Order No.
DAB Test Transmitter ¹⁾	R&S SDB 601	3542.1009.02
DAB Test Transmitter ¹⁾²⁾ , with integrated GPS receiver	R&S SDB 601	3542.1009.04
Options		
Integrated GPS Receiver ²⁾	R&S SDB-B20	2080.4700.02
Accessories		
19" Installation Kit	R&S ZZA 211	1096.3260.00
XLR Adapter (set of two)		1078.3733.00

¹⁾ Including manual, operating software (CD-ROM), RS-232-C cable, power cable.

²⁾ Including antenna, operating software, manual, angle bracket for antenna.

Other DAB products from Rohde & Schwarz

DAB Transmitter Family R&S NA/NL 6000 (medium output power)

DAB Transmitter Family R&S NA 7000 (high output power)

DAB STI Ensemble Multiplexer R&S DM001

Digital Sound Broadcast Data Inserter R&S DSIP020

DBC WebCarousel™ R&S DTVCAR

DAB MOTCarousel™ R&S MOTCAR



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