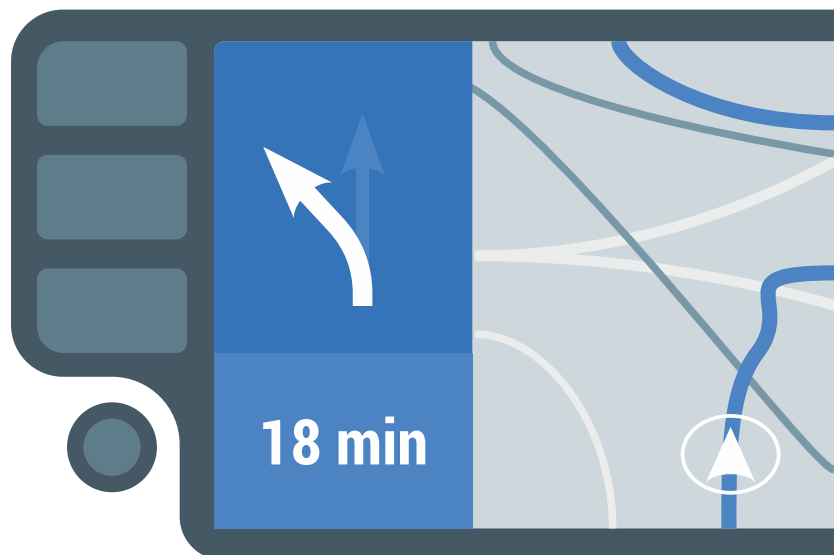
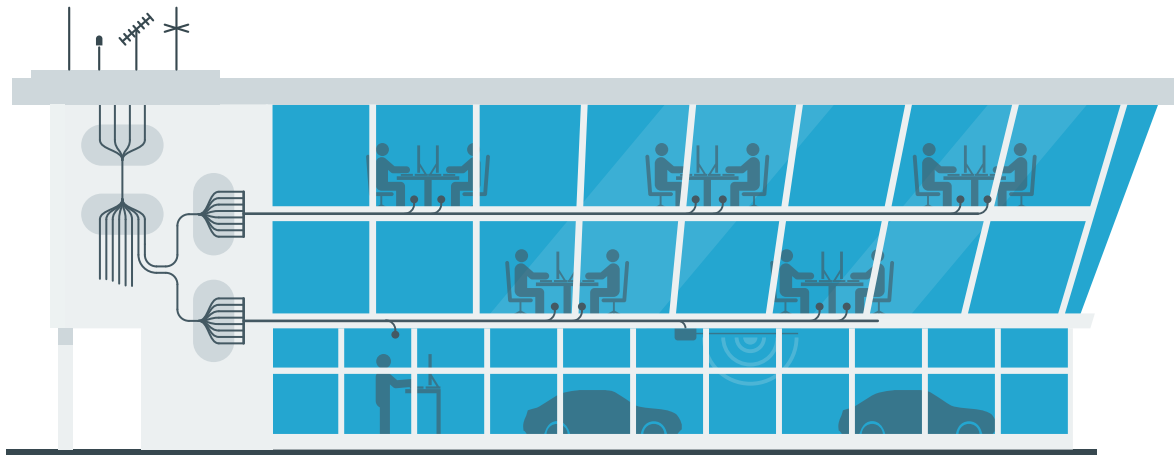


RF Test and Measurement for Car Infotainment Systems



Car Infotainment Test Environment

Modern infotainment components process a variety of information that is radiated via broadcast antennas. For the operation of infotainment components in test environments, generator- or live RF signals are required. Modern infotainment components contain numerous receivers for different broadcasting and satellite signals as well as front-ends for mobile and wireless standards. Validating the complex interaction of all functions requires presence of all the RF signals simultaneously.



Several test environments

Infotainment functionality is tested in various stages during the overall development process.

During software development many developers in parallel check new code on HW platforms requiring real-time stimulation of the various infotainment components. Here the target is to provide a simple to use and reliable setup that requires no specific RF know-how.

The hardware development groups also require a test environment with stable RF signals. More RF know-how is available, and additional requirements can be the possibility to modify the presence, level or composition of signals.

During production testing industrial grade test benches typically require generated, repeatable stimulation with RF signals. Focus here is on automated generation of repeatable stimulus.

One solution

An economical approach for the supply of infotainment components with RF signals in production, development or field testing application, is the use of wideband, active RF signal combiners and multicouplers. They combine and distribute RF signals of various broadcast and satellite navigation standards losslessly to almost any number of outputs in a cost-efficient, space-saving way. The RF connection between signal combiner and multicoupler is made via a single common coaxial line. Active distribution is an order of magnitude less expensive than multiplying measurement and signal generation equipment.





Robust Design

The signal distribution solution by Becker Nachrichtentechnik GmbH is based on industrial-grade components and single cable distribution. The high output isolation of the active multicouplers creates an isolated environment for each test bench. Only one small table-top unit is placed on each test bench, with a cable set adapted to the particular infotainment equipment. Active signal distribution allows to compensate for cable loss, balance the signal level at the outputs and cascade the system to more and more end points. In contrast legacy signal distributions are often built based on consumer grade passive components with limited bandwidth. A multitude of cables is required and unreliable connectors often create lost effort. On top the low isolation of passive splitters leads to undesirable side effects: a short on one test bench affects the running test on other test benches connected to the same splitter.

Scalability

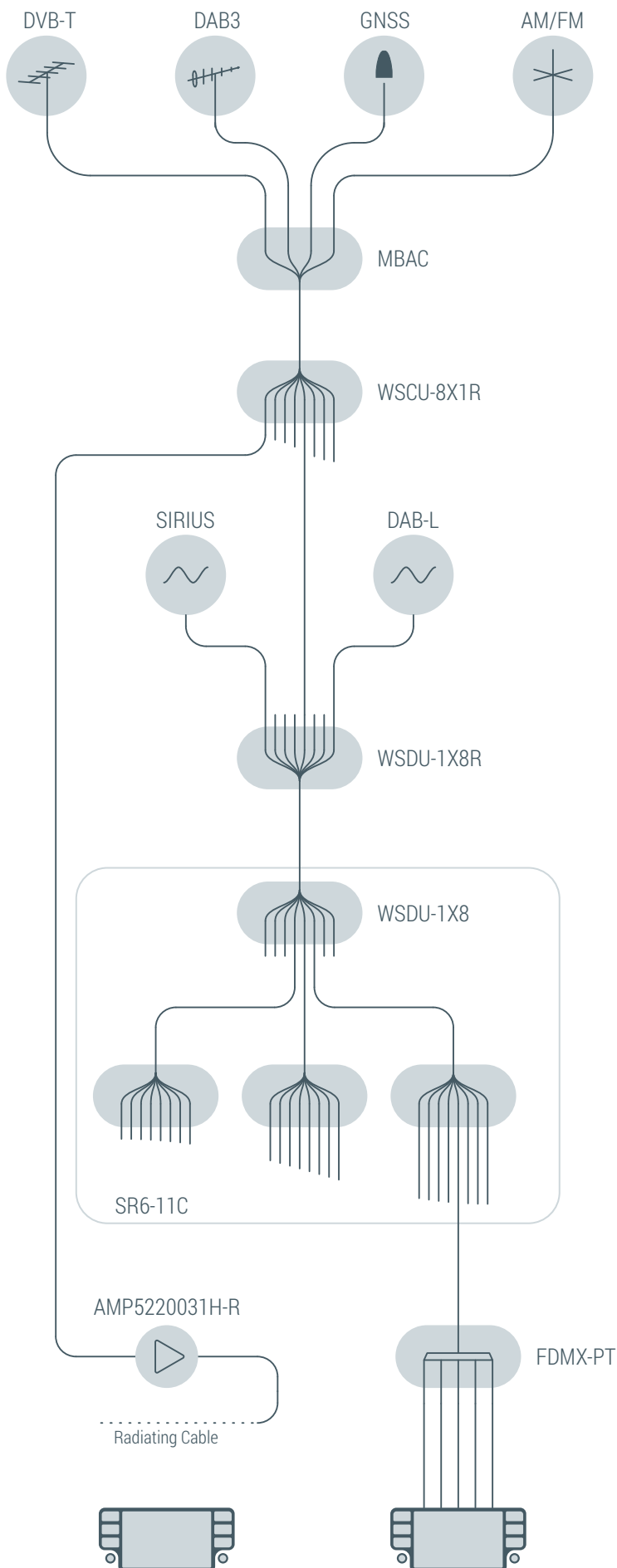
The signal distribution solution by Becker Nachrichtentechnik GmbH has been conceived like a Lego system. Due to the active components, signal level does not change significantly when adding more and more test benches or signal sources. The laboratory or development manager can start with a small investment and extend over time to more and more end points and additional functionality like automated signal switching or attenuation.

Bandwidth

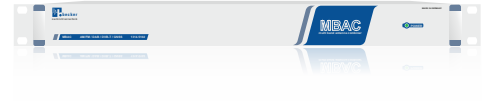
When infotainment started only signals less than 110 MHz were needed. Today the frequency range extends to satellite signals like GPS in the 1.5 GHz range. The solution by Becker Nachrichtentechnik is specified for up to 4 GHz and thus is a future proof investment covering all broadcast signals by the same components.

Automation option

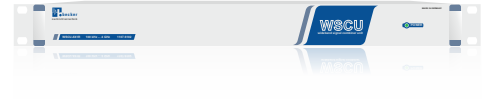
Using e.g. switches, attenuators and level detectors that can be remote controlled through LAN or USB interface, an automated environment can be created to accommodate even the most complex broadcast signal stimulus towards production test benches. The interface is based on simple "ASCII" text commands in order to simplify integration into existing automation software designs. An example application is the hand-over testing from FM to DAB and back by running the signals through programmable attenuators.



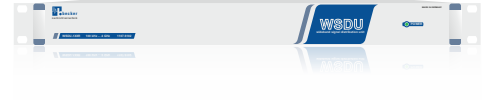
MBAC
Antenna Combiner



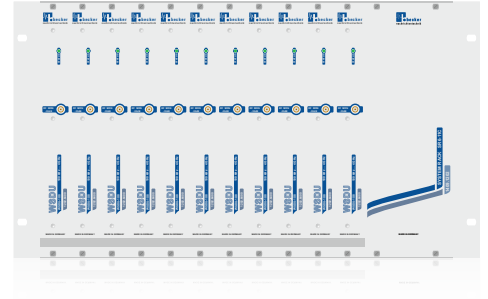
WSCU-8X1R
Wideband Signal Combiner



WSDU-1X8R
Wideband Signal Distribution



WSDU-System
Scalable Signal Distribution Platform



AMP5220031H-R
Wideband Driver Amplifier



FDMX-PT
Frequency Demultiplexer



ATE System (sensitivity test & phantom supply)

Using the modular approach of Becker Nachrichtentechnik GmbH complex automation tasks become possible in the RF domain.

In one compact 19" 6U device multiple functions can be performed under remote LAN or USB control and integrated into a larger test bench.

The system below shows a customer application that allows to perform multiple validation tasks for two DUTs (devices under test) simultaneously:

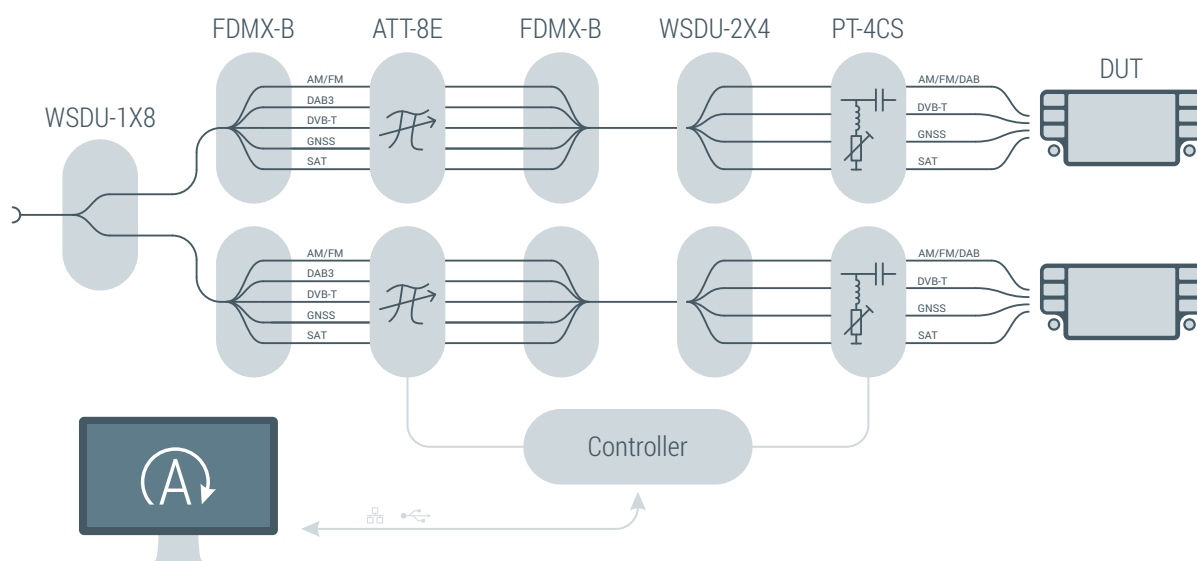
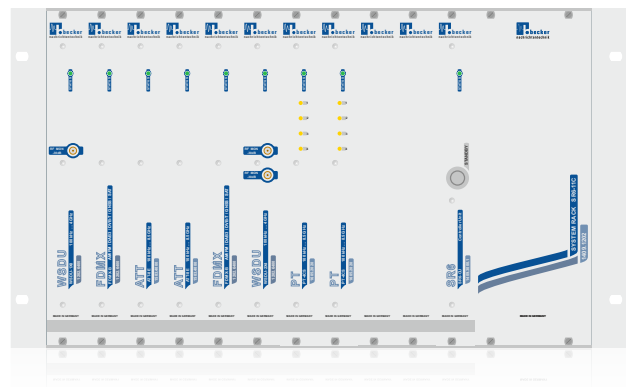
- Checking the receiver sensitivity (FM/AM, DAB, GNSS, DVB-T, SAT)
- Forcing the infotainment equipment to switch between FM radio and DAB radio
- Emulation of active antennas
- Evaluation of phantom supply sources

First the combined broadcast signal is fed into the system by a single coaxial cable. It is split by an active multicoupler into two signal chains corresponding to the two DUTs at the end.

Each signal chain is breaking up the combined signal into its frequency bands, attenuates each band separately by a programmable gain before recombining it. Finally the re-combined signal is fed into the DUTs' receivers using programmable DC loads that allow to measure the phantom supply.

TYPICAL DATA


Frequency Bands	AM/FM DAB3 DVB-T GNSS SAT
Impedance	50 Ohm
Inputs	1
Outputs	2x4 (2 DUTs)
Attenuation Range	up to 95.25 dB
Attenuation Step Size	0.25 dB
DC Load Adjustment Range	0 ... 400 mA
DC Load Step Size	0.5 mA
Voltage measuring range	0 ... 18 V
Form Factor	19" 6U





CATEGORY	PRODUCT	DESCRIPTION	FREQUENCY RANGE
Signal Distribution	WSDU-1X8	High Dynamic 1 to 8 Multicoupler	100 kHz ... 4000 MHz
Signal Distribution	WSDU-2X4R	High Dynamic 2 Channel 1 to 4 Multicoupler	100 kHz ... 4000 MHz
Signal Distribution	WSDU-2X4E+	Extremely Wideband 2 Channel 1 to 4 plus 1 Channel 1X2 Multicoupler	20 MHz ... 8000 MHz
Signal Distribution	WSDU-1X4ER	Extremely Wideband 1 to 4 Multicoupler	20 MHz ... 8000 MHz
Signal Distribution	WSDU-2X4ER	Extremely Wideband 2 Channel 1 to 4 Multicoupler	20 MHz ... 8000 MHz
Signal Distribution	WSDU-1X8ER	Extremely Wideband 1 to 8 Signal Multicoupler	20 MHz ... 8000 MHz
RF-Switch	RSWU-8SPSTS	8 Channel Non-reflective Solid State SPST Switch	100 kHz ... 8500 MHz
RF-Switch	RSWU-4SPDTS	4 Channel Non-reflective Solid State SPDT Switch	100 kHz ... 8500 MHz
RF-Switch	RSWU-2SP4TS+	2 Channel SP4T plus 1 Channel SP2T Non reflective Solid State Switch	100 kHz ... 8500 MHz
Demultiplexer	FDMX	Demultiplexer for Broadcast and Navigation Signals	AM/FM, DAB, DVB-T, GNSS, SAT
Demultiplexer	FDMX-PT	Demultiplexer with Phantom Supply Test	AM/FM, DAB, DVB-T, GNSS, SAT
Demultiplexer	FDML	Adapter for AM/FM/DAB3 Broadcast Signals	AM/FM/DAB3
Demultiplexer	FDMX-B	Broadcast Splitter/Combiner	AM/FM, DAB, DVB-T, GNSS, SAT
Current Sink	PT-4CS	4 Channel Programmable DC Current Sink 0...400 mA	100 kHz ... 8500 MHz
Current Sink	PT-4CL	4 Channel Programmable DC Load	100 kHz ... 8500 MHz
RF Attenuator	ATT-8E	8 Channel Digital Step Attenuator, 0 ... 31.75 dB	100 kHz ... 8500 MHz
RF Filter	FBS-1590	L1 Band GNSS Notch Filter 1555...1625 MHz	20 MHz ... 8000 MHz
System Controller	SR6-CU	Controller Unit for SR6-11C System Platform	
System Platform	SR6-11C	System Platform with 11 Slots	
Accessories	RFT-N	RF Terminal with N Female Connector	
Accessories	CP-N	8 Port 1U N Connector Terminal with Labelling Strips	

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