RADIO TEST SOLUTION

DIGITAL RADIO TESTER

RWC2010B

DAB DAB+
DRM30 DRM+
FM-RDS AM

ANALOG RADIO TESTER

RWC2100F

FM-RDS AM
RDS Receiver
Audio Analyzer

RedwoodComm

http://www.redwoodcomm.com
sales@redwoodcomm.com

OVERVIEW

RWC2010B Digital Radio Tester provides convenient and efficient test environment to evaluate receivers for a wide range of broadcasting technologies – DAB, DAB+, DMB, DRM30, DRM+, AM, FM and RDS, with full control over system parameters. It supports various kinds of data services such as BWS, TPEG, EWS, EPG, SLS and it has ETI and MDI file player function so that any users' files recorded in the field can be played back in labs. It also provides analog AM and FM radio test functions with editable RDS configuration.

It transmits RF output power of -10 to -120dBm (0 to -110dBm for CW signal) with 0.1dB step, and supports Band LF, MF, HF, I, II, and III frequency ranges.

KEY FEATURE

■ Supporting DAB, DAB+, DMB, DRM30, DRM+, AM, FM, RDS functions

■ Built-in Ensemble Multiplexer

· Easy to edit Ensemble: 15 service components for DAB and 4 streams for DRM

· Various data services such as BWS, TPEG, EPG, and SLS.

· Reconfiguration, Announcement, Alternative Frequency, TII, and Time functional tests

■ ETI, MDI and DRM IQ file player function with OFDM Modulation

■ Service / Seamless Linking Test

· Use of two or more RWC2010B or combination of RWC2010B and RWC2100F

· DAB-DAB, DAB-DRM, DAB-FM, DRM-FM

■ Single Frequency Network (SFN) Test

· Two RWC2010B testers can transmit precisely synchronized DAB or DRM signal

· Adjustable delay between signals with 0.1us resolution

■ Multi-Channel FM & RDS function

· Up to 3 FM / RDS radio signals can be generated simultaneously

■ Supported frequency bands

· BAND I/ II/ III (47 to 68MHz, 87 to 108MHz, 174 to 250MHz)

· LF/ MF/ HF BAND (0.15 to 30MHz)

ENSEMBLE MULTIPLEXER

RWC2010B is equipped with Ensemble Multiplexer, which simply enables to simulate the functions of broadcast stations. Protocol parameters can be easily edited via friendly GUI, and applied imme-diately to the signal being broadcasted. The built-in Ensemble Multiplexer supports up to 15 Services and 15 Service Components for DAB/DMB and up to 4 Streams for DRM with easy on/off configuration, where the graphical structure helps users understand how to build.
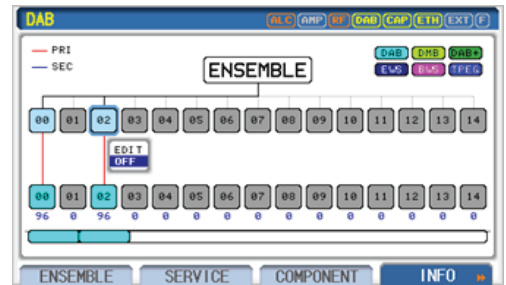
## RECONFIGURATION, ANNOUNCEMENT, ALTERNATIVE FREQUENCY

RWC2010B supports high-tech protocol tests such as Reconfigura-tion, Announcement, and Alternative Frequency.
Reconfiguration is a function to provide the required mechanisms for changing the multiplex configuration whilst maintaining conti-nuity of services. It is achieved by sending at least the relevant part of the information of the future multiplex configuration in advance as well as the information for the current configuration. With RWC2010B, users can set the current and future configurations from the GUI and initiate the reconfiguration procedure whenever they want. Announcement is a function for a compulsory situation or automaton functions. For example, emergency situations may activate an announcement function. This function changes the channel for every listener so that they can hear the emergency message or announcement. Alternatively, it can also be used by listeners to set the channel to change to a specific program at a specific time. RWC2010B offers a screen that the user can use to change the announcement function, and it transmits announcement related FIG for DAB/DMB and SDC data for DRM for compulsive channel changing. Alternative frequency is a function that allows a receiver to re-tune to a different frequency that provides the same station or related, when the original signal becomes too week. The RWC2010B provides an easy AF test function by setting the AF frequency and target system through the GUI, and controlling the output power.
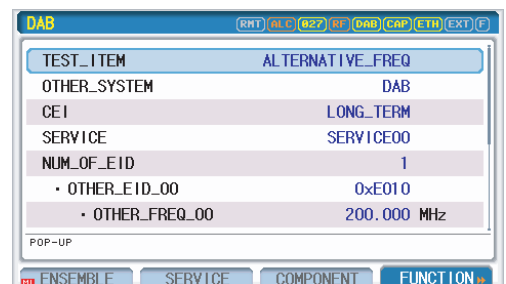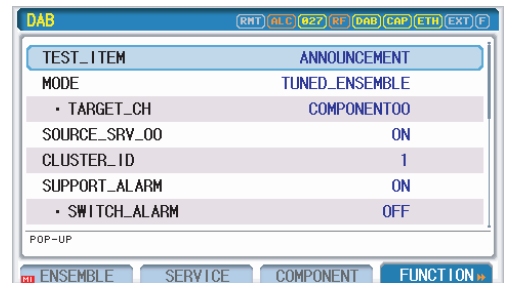
ANALOG AM/FM AND RDS TEST

RWC2010B provides analog AM/FM and RDS test functions. Most DAB/DMB/DRM receivers also have analog AM/FM features, so it is meaningful to integrate the test system with both digital radio functions like DAB/DMB/DRM functions and analog radio functions into a single tester.
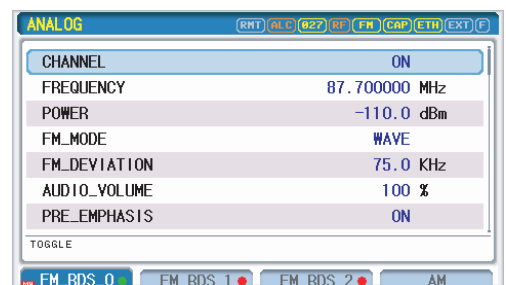
ETI, MDI AND DRM IQ FILE PLAYER

The ETI (or MDI) file describes the characteristics of a signal suitable for transporting a full DAB Ensemble (or DRM Multiplex), where the ETI comprises a number of sub-channels and a formatted Fast Information Channel (FIC) between the DAB Ensemble provider and the Transmission network provider, and the MDI does a number of streams and a formatted Service Description Channel (SDC) between the DRM Multiplex provider and the Transmission network provider. It means that if a specific broadcasting station's T-DMB/DAB (or DRM) signal is recorded as an ETI (or MDI) file, the recorded file contains all the information about the station. Using these files with the RWC2010B's ETI/MDI function, specific broadcasting stations' T-DMB/DAB signals or DRM signals can be easily regenerated in labs.
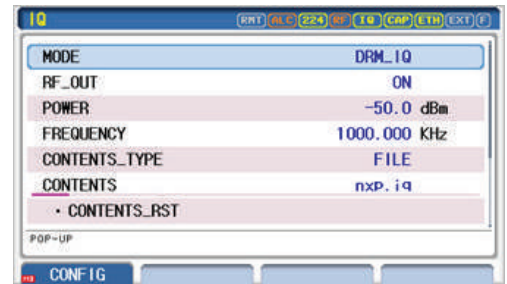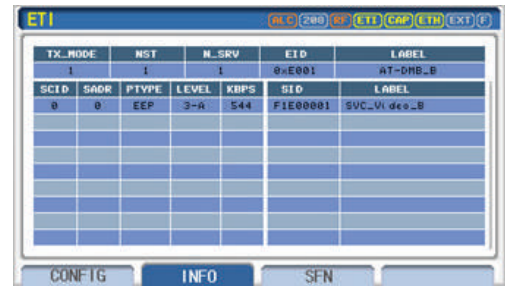
PC SOFTWARE

For user convenience, RWC2010B's PC application utility is provided. It can be used to stream files in real-time, download and manage contents files, capture RWC2010B's screen, and edit radio texts in DAB, DRM, and FM-RDS. Various contents files can be downloaded from the RedwoodComm server into a user PC and streamed to RWC2010B for real-time broadcasting, and the location of the contents file can be changed while broadcasting. This feature is very useful when testing various contents files or large files without downloading to RWC2010B. Radio Text edition function can be used for all text editing of DAB, DRM, and FM-RDS. It supports various coding methods such as EBU-LATIN, UCS-2, UTF8, etc. Therefore, it is possible to edit text regardless of country or region.
It also provides a tool to configure the test items and conditions in the RWC2010B to assess receivers if they meet the DRM's minimum requirements.
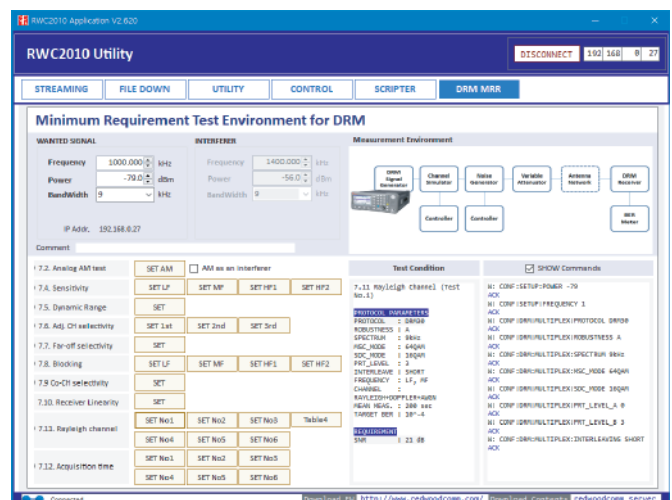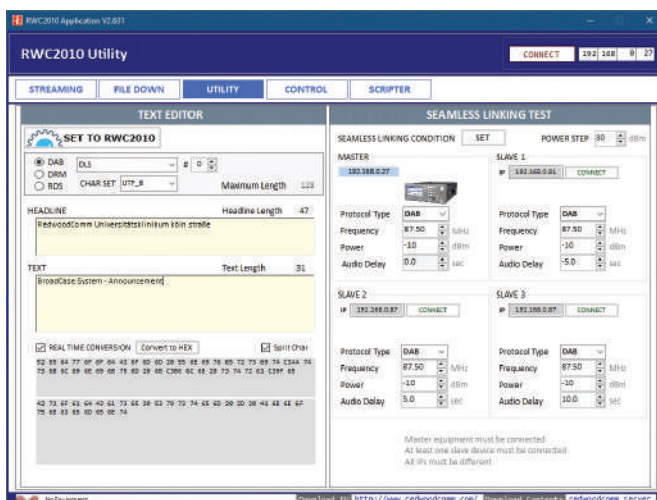
SPECIFICATIONS

Frequency	LF/MF/HF Band: 0.15MHz to 30MHz BAND I/II/III: 47MHz to 68MHz, 87MHz to 108MHz, 174MHz to 250MHz Resolution: 1kHz Accuracy: ±1.5ppm/year @ operating temperature
Output Level	-10dBm to -110dBm (OFDM: -10dBm to -120dBm) for BAND I/II/III -20dBm to -110dBm (OFDM: -20dBm to -120dBm) for LF/MF/HF BAND Resolution: 0.1dB Accuracy: ±1dB
VSWR	Better than 1:1.5
Modulation	OFDM (Orthogonal Frequency Division Multiplex) D-QPSK(Differential Quadrature Phase Shift Keying), 16QAM, 64QAM FM/AM
Frequency Reference	Internal Reference & Stability: 10MHz, ±1.5ppm/year @ operating temperature External Reference: 10MHz (0dBm to +20dBm MAX)
I-Q Out Port	Output voltage: ±1Vpp
Remote Programming Ports	RJ45(Ethernet) RS-232C
Miscellaneous	Operating temperature: 5 to 40℃ Line Voltage: 100 to 240 VAC, 50/60Hz Dimension: 240(W) x 110(H) x 340(D)mm Weight: 5.5Kg

RWC2010B Front View
4.3" TFT-LCD Display
Power On/Off Switch
Key board, Rotary
1 x RF Out Port

RWC2010B Rear View
LAN, RS-232, DATA I/O
10 MHz Reference In
I/Q Baseband Out
AC Power Input

OVERVIEW

The RWC2100F, a multi-channel Analog Radio Tester, provides FM-RDS, AM, RDS receiver and audio analyzer.

3-TX channels can be transmitted simultaneously and each channel can be set to FM-RDS or AM. FM-RDS provides many editable protocol parameters such as PID, PS NAME, (e)RT(+), etc. It also provides many functional tests such as AF, EON, TMC, etc. The RDS receiver receives RDS signals over the air and displays RDS parameters. The received RDS signal can be recorded as a file, so that it can be played back with the FM-RDS TX function. The audio analyzer not only measures the audio signal quality (SINAD, THDN and SNR) and frequency, but also shows audio waveform and audio spectrum. All functions can be controlled by PC software and all parameters can be saved and loaded.

KEY FEATURE

■ FM-RDS Transmitter
· Supports 3 independent transmission channels
· Supports various audio signals
  (MONO / STEREO / SWEEP / WAVE File)
· Supports fully configurable RDS(RBDS) - AF, RT, TMC, EON
· Supports radio text (RT, RT+, eRT, eRT+) with RDS code,
  UTF-8 and UCS-2
· Supports transmission a recorded RDS file

■ AM Transmitter
· Supports 3 independent transmission channels
· Supports various audio signals (MONO / SWEEP / WAVE File)
· Supports EON, user configurable TMC function

■ RDS Receiver
· Receives and analyzes one FM-RDS radio signal
· Displays RDS information such as PS_NAME, (e)RT(+), AF list, etc.
· Records the RDS data as files

■ Audio Analyzer
· SINAD, THDN, SNR and frequency measurement function
· Waveform and spectrum display of audio signal

■ PC Software
· It consists of 5 control panels such as Transmitter, RDS Receiver, Audio analyzer, scripter and combination panel
· All functions can be operated simultaneously from each control panel
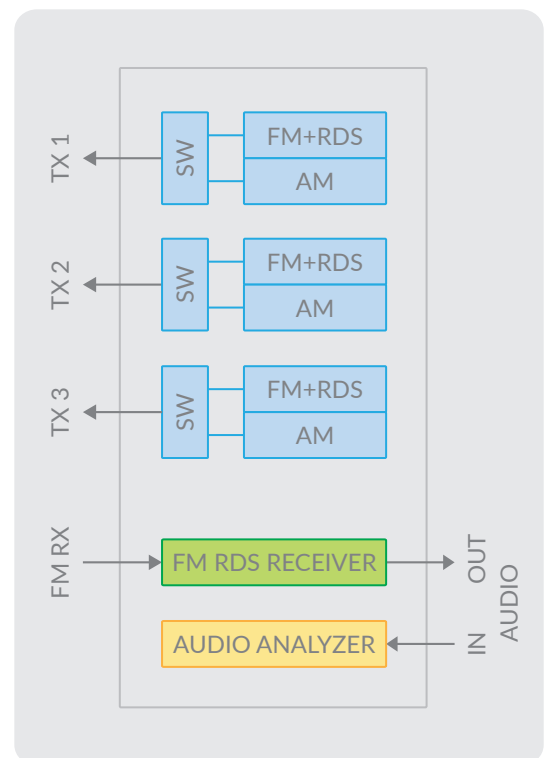
FM-RDS TRANSMITTERS

Three channels of independent transmitters can be transmit signals simultaneously, and each TX channel can be set to FM-RDS or AM. Each channel can transmit FM and RDS (Radio Data System) signals at the same time. It is possible to transmit files stored in RDS or edit protocol parameters such as PID, PS NAME, and PROGRAM TYPE, and all radio text editing functions such as RT/RT+/eRT/eRT+ defined in the RDS protocol are provided. It also provides very useful test functions such as AF (Alternate Frequency MODE A/B), EON-ON, EON-SWITCH, TMC, TIME, etc. As the FM modulated signal source, WAVE files can be saved and used, or MONO, STEREO, and SWEEP are supported, so it can be appropriately selected for measuring the receiver performance of DUTs.
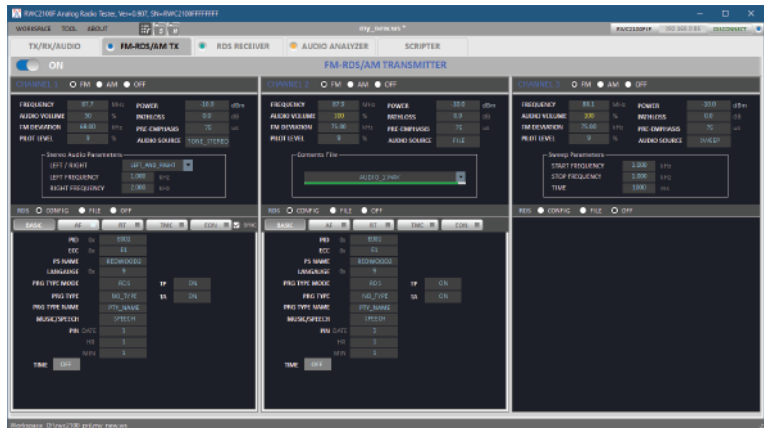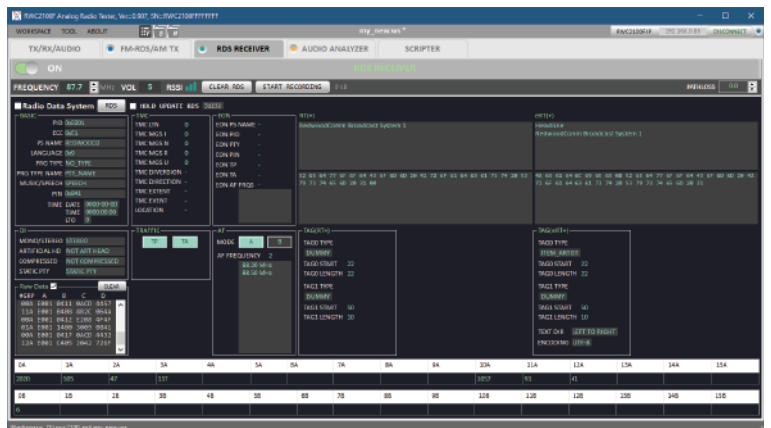

AM TRANSMITTERS

The RWC2100F provides 3 independent AM transmitters. Users can select each channel from FM to AM or turn each transmitter on and off. Users can select mono-tone, sweep, or wave file as the audio source for each AM channel. Users can also create various test environments by independently setting the frequency, power, modulation index, and pathloss of each channel. 1kHz mone tone is very useful for SINAD and THD measurement, and sweep audio is very useful for frequency characteristic measurement.
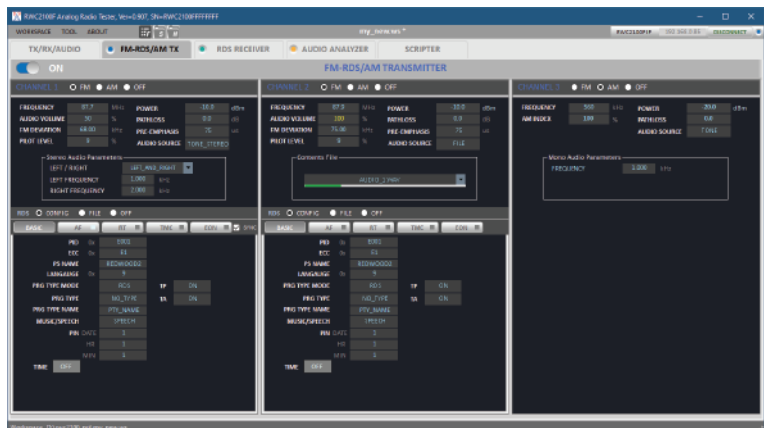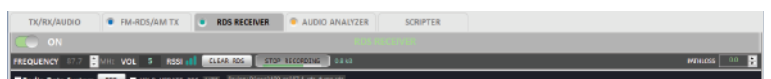

RDS RECEIVER

The RDS receiver demodulates the RDS signal from the received FM-RDS signal and displays the data. The RDS receiver displays all parameters defined in the protocol.


RDS RECORDING

RDS signals can be saved as files, and the saved files can be transmitted using the RDS file transmission function of the FM-RDS TX of the RWC2100F.
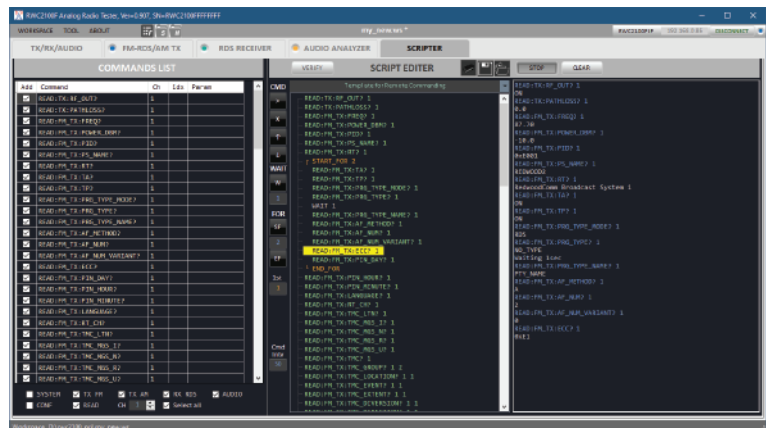
AUDIO ANALYZER

The audio analyzer measures the quality of the audio signal and displays it in various types of values such as SINAD, THDN, SNR and frequency. Measured values can be displayed more stably by increasing the number of measurements. It also displays audio wavefor-ms and audio spectrum. Audio analyzer is very useful for automatic measuring of RX sensitivity by reducing the TX power of the 2100F TX signal and monitoring a radio receiver's audio output with the audio analyzer.
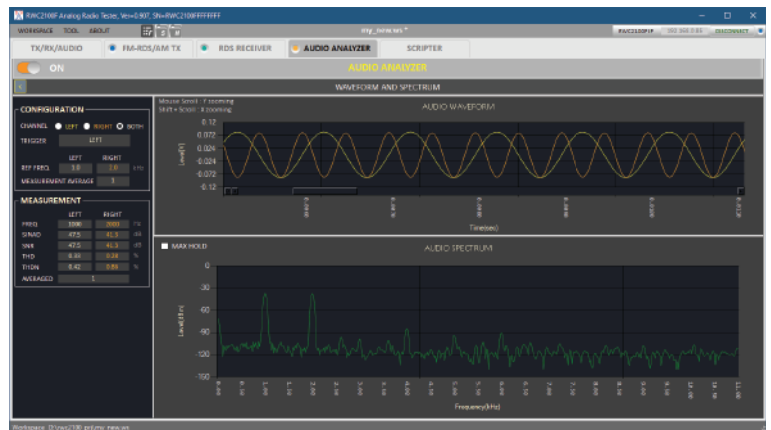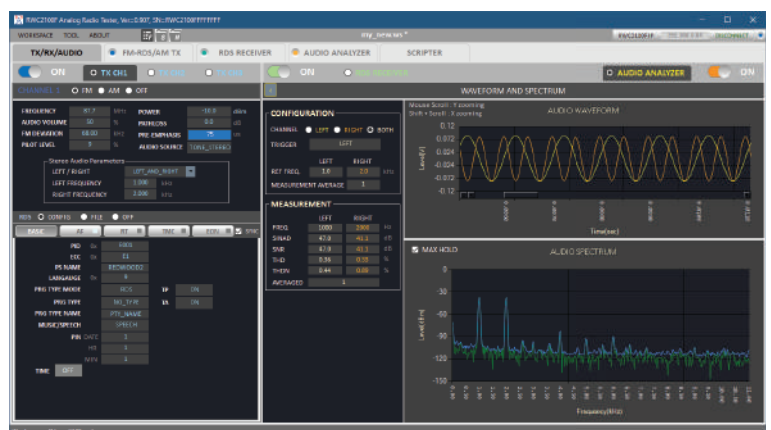
SCRIPTER

RWC2100F provides a scripter function that allows users to send and receive commands. Users can use syntax such as for and wait to more flexibly configure the instruction set for the user desired scenario. By using this function, users can control all functions of RWC2100F, and the used instruction set can be saved and read as a text file.

COMBINATION SCREEN

The RWC2100F's PC application combines FM-RDS/AM transmitter and RDS receiver or FM-RDS/AM transmitter and audio analyzer to provide a combination screen for conve-nient transmission control, RDS monitoring and audio analysis in one screen. By selecting the FM-RDS transmitter and audio analyzer combination screen, receiving the FM or AM signal transmitted from the RWC2100F to the user's DUT using the DUT, inputing the audio signal output from the DUT back to the RWC2100F audio analyzer, and measuring SINAD of the DUT, users can measure the performance and audio quality of the DUT very simply.

SPECIFICATIONS

|	
Transmitter Characteristics	· Frequency Range: 500kHz to 1,800kHz (AM), 76MHz to 108MHz (FM) · Frequency Accuracy: ±2Hz (AM), ±3.5kHz (FM) · Output Level: -10dBm to -90dBm (AM), 0dBm to -90dBm (FM) · Output Level Resolution: 0.25dB · Output Level Accuracy: ±1dB · VSWR: Better than 1:1.5
Receiver Characteristics	· Input Frequency: 76MHz to 108MHz
Audio Analyzer Characteristics	· Input Frequency: 0.1kHz to 20kHz · Input Range: Single Ended 2.25 Vrms · Bandwidth: 20 kHz · Common-Mode Rejection Ratio(CMRR): 56dB · Connection Type: 3.5pi Stereo
Remote Programming Ports	· RJ45 (Ethernet) · RS-232C
Miscellaneous	· Operating temperature: 5 to 40℃ · Input: DC 12V, 3A · Dimension: 166(w) x 50(h) x 194(d)mm · Weight: 950g

RWC2100F
Front View

2.81" OLED Display
Power On/Off Switch
3 x TX, 1 x RX Port

RWC2100F
Rear View

LAN, RS-232
Audio Input, Output
DC 12V Input

SERVICE FOLLOWING CONCEPT

DAB Broadcasting Area

FM Broadcasting Area

Automatic switching from DAB to FM
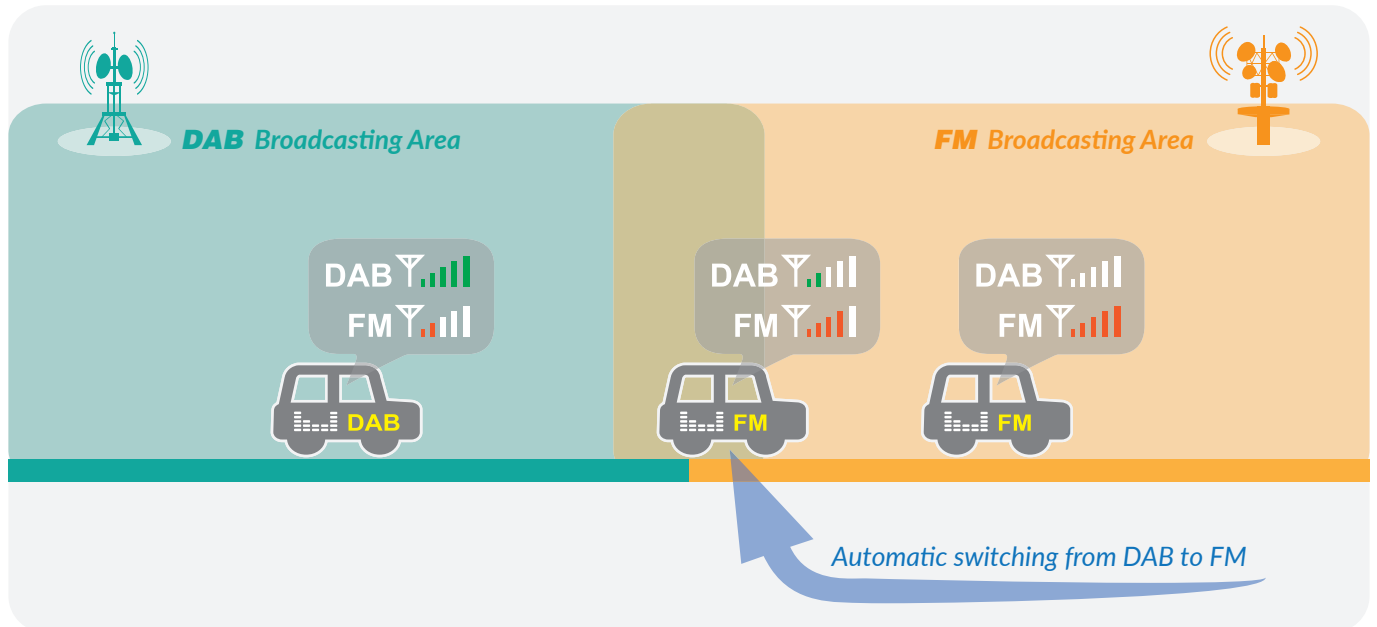
To test the service following function of receivers in labs, two or more broadcasting emulators are required. Especially, to test 'the seamless linking function', two or more broadcasting emulators should be synchronized with adjustable sync delay. Using RWC2010B or RWC2100F, many combination of service following test (DAB to DAB, DAB to DRM, DAB to FM, DRM to DRM, DRM to FM) can be performed in labs quite easily. Users can assign one RWC2010B as Master and other RWC2010B or RWC2100F as Slave. You can emulate the various broadcast system environment and test the functionality of your receivers perfectly with low cost.

■ *Service following* The operation of maintaining the same audio or data content that the user has selected in varying reception conditions

■ *Seamless linking* The operation of switching to another transmitter and continuing service without audio discontinuity
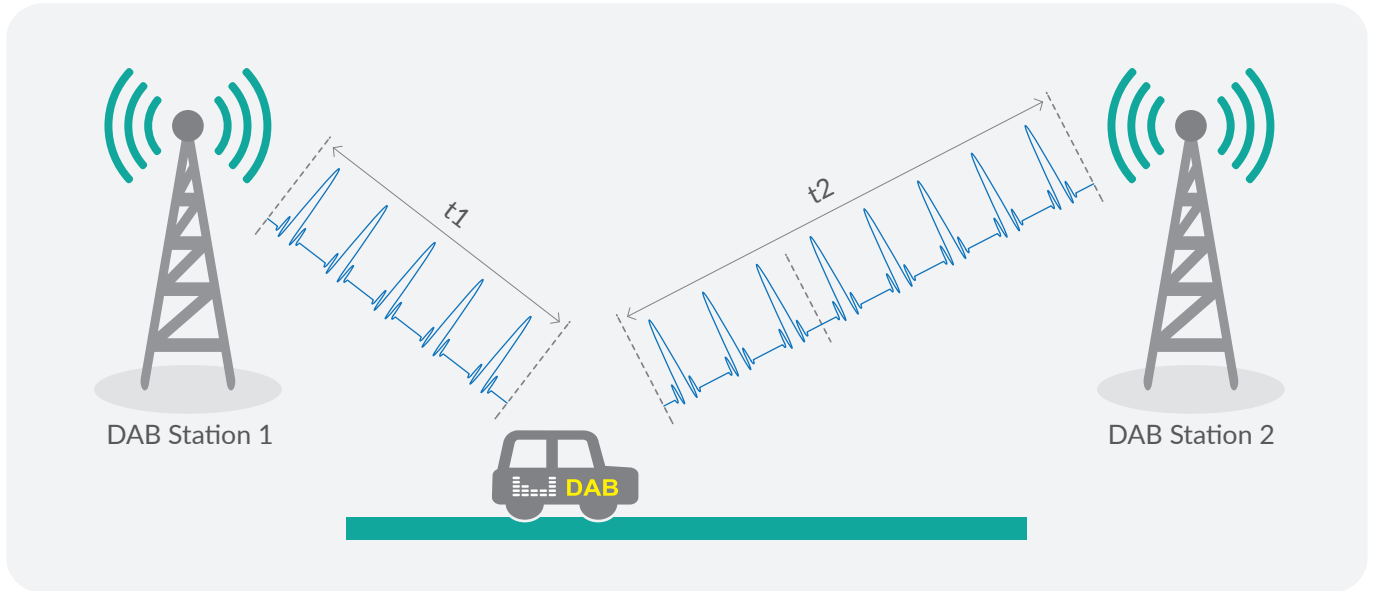
SEAMLESS LINKING TEST SOLUTION

Master
[RWC2010B]

SYNC

Slave
[RWC2010B or RWC2100F]

DUT (Receiver)

Adjustable Audio delay
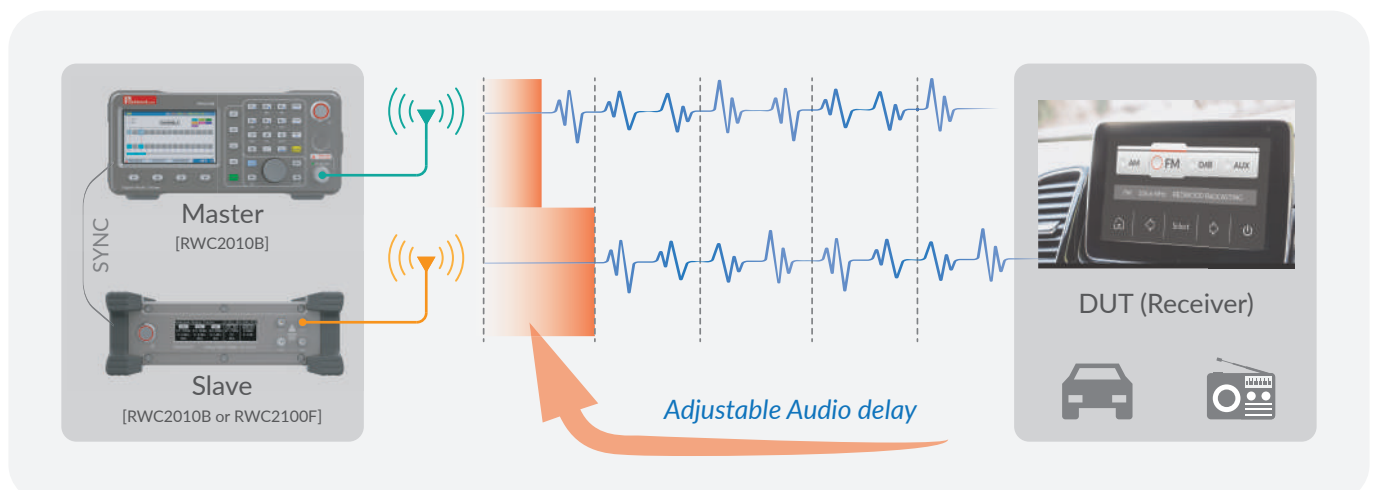
It provides a seamless linking test solution with adjustable audio synchronization between two emulators.

SINGLE FREQUENCY NETWORK (SFN) TEST CONCEPT

DAB Station 1

DAB Station 2

t1

t2

DAB

To test SFN in labs, two broadcasting emulator are required. And two broadcasting emulator should be synchronized with adjustable sync delay. Using two RWC2010Bs, SFN test can be performed in labs very easily.

SFN TEST SOLUTION

t2

DAB Station 2
[RWC2010B]

SYNC

t1

DAB Station 1
[RWC2010B]

Adjustable time delay

DUT (Receiver)
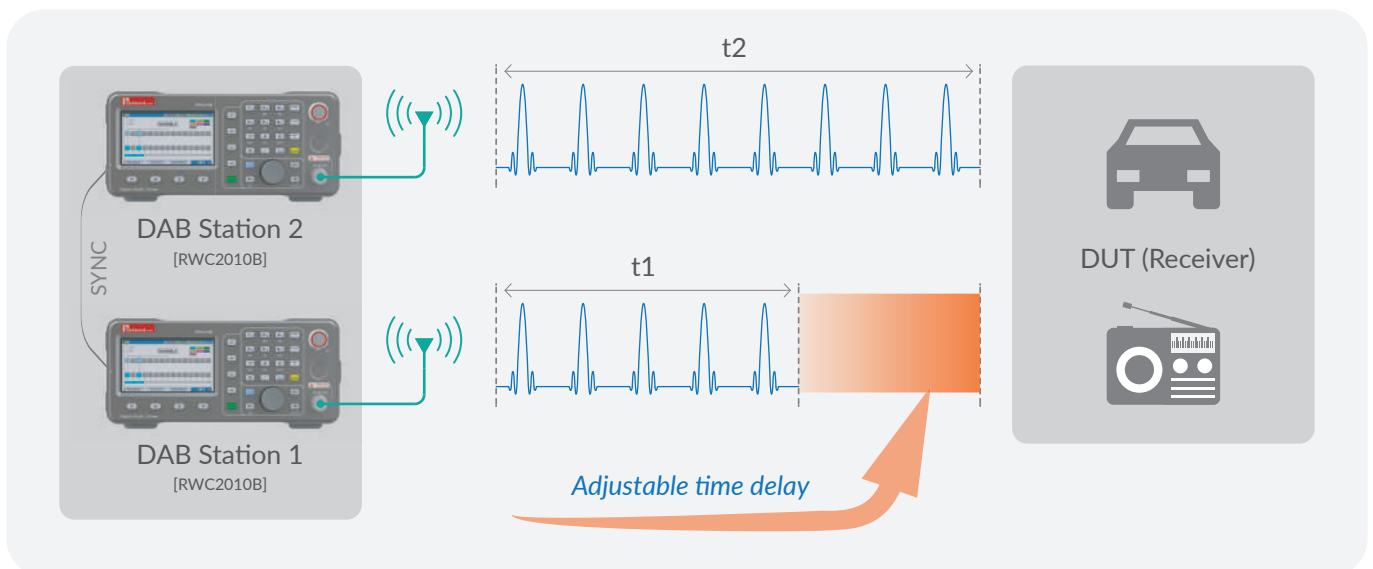
SFN is a broadcasting network in which multiple transmitters simultaneously send the same signal through the same frequency channel. By utilizing the spectrum efficiently, it can provide a greater number of programs than conventional MFN. However, SFN transmission can be traced back to the DUT as a serious multipath propagation, which can cause fading. Therefore, the DAB receiver must be designed to guarantee the reception performance in the SFN environment. Using two RWC2010Bs, you can easily and inexpensively create an SFN environment in LABs to measure the performance of the DUT. RWC2010B can be synchronized with another RWC2010B in us unit, and the same contents can be provided using ETI/MDI files.

MEASURING SENSITIVITY OF RADIO USING SINAD

Generally amplifiers have harmonic distortion and noise in their audio output signals. SINAD is useful for quantifying the ratio of power to all harmonics and noise components present in an audio signal. Using the THD and SINAD values, users can find out where the signal distortion is caused. Users can easily find and fix the distortion of radio receivers by measuring SINAD and THD using the Audio Analyzer of RWC2100F.
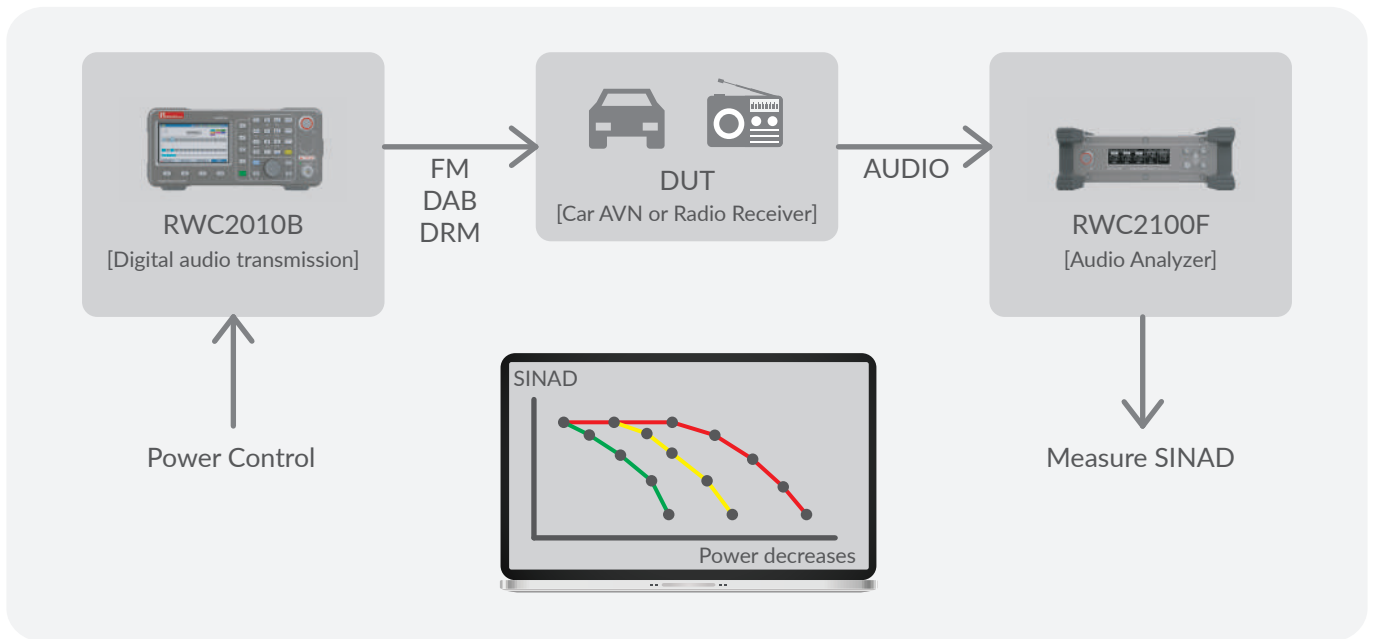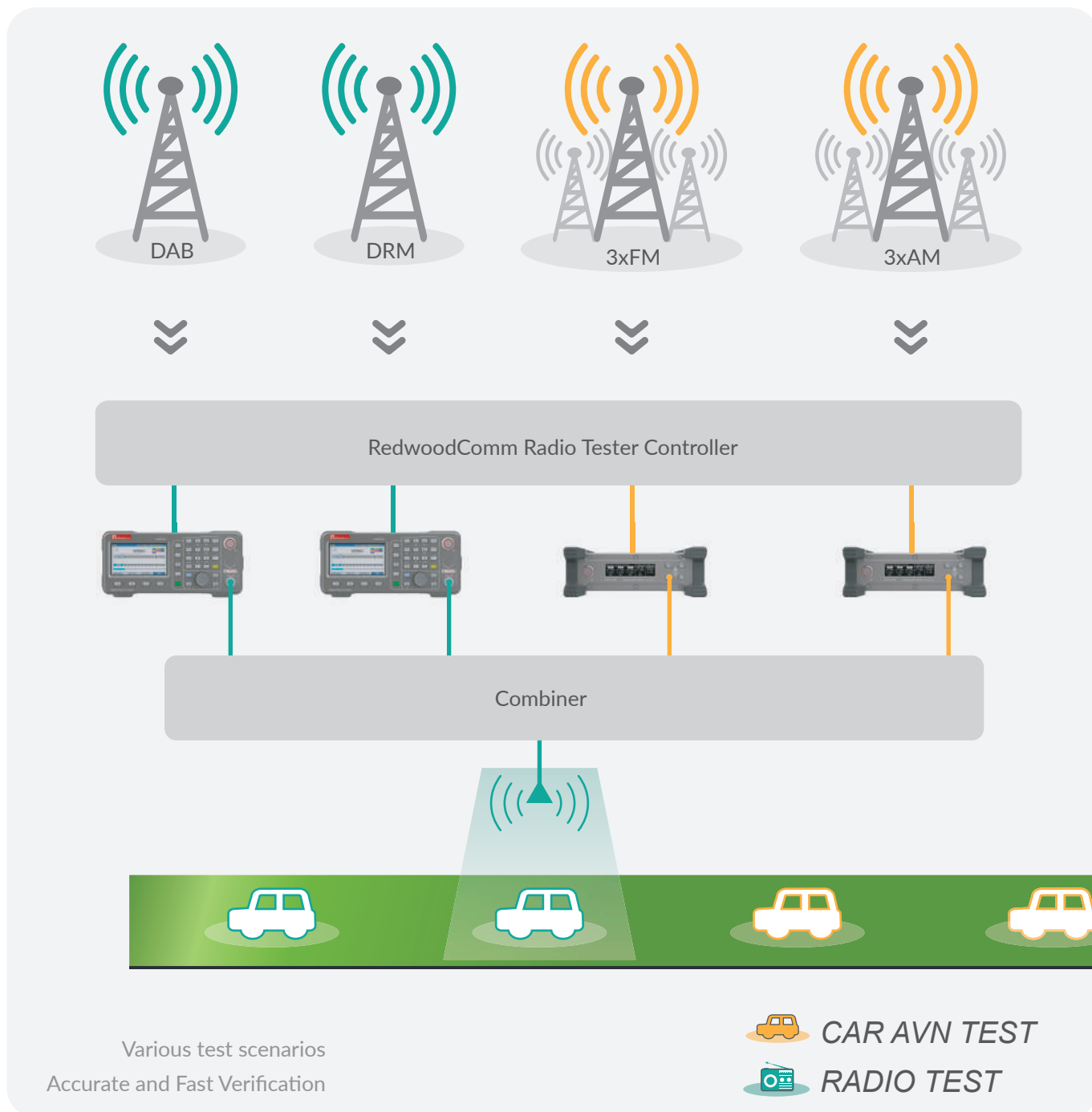

RX sensitivity can be measured by monitoring the audio output of radio receivers (DUT) with the audio analyzer of the RWC2100F while decrementing the TX power of the RWC2010B.
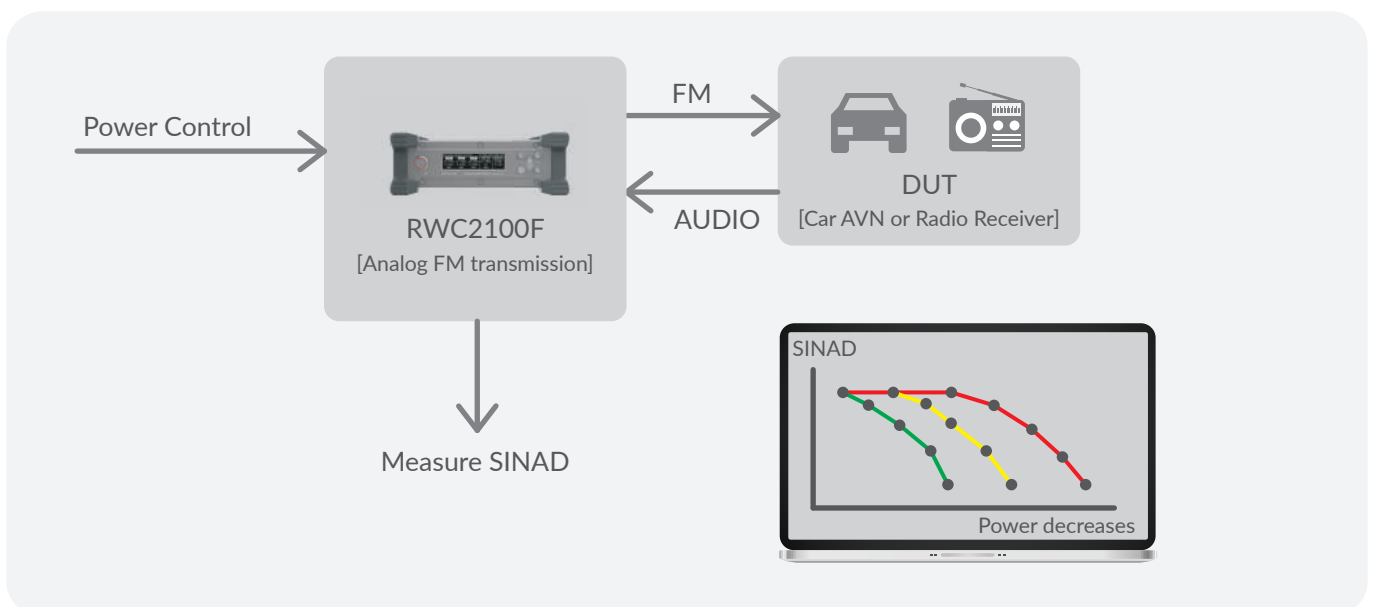
RX sensitivity can be measured by monitoring the audio output of radio receivers (DUT) with the audio analyzer while decrementing the FM TX power of the RWC2100F.

RedwoodComm

EXAMPLE OF RADIO TEST SOLUTION

DAB   DRM   3xFM   3xAM

RedwoodComm Radio Tester Controller

Combiner

Various test scenarios
Accurate and Fast Verification

🚗 *CAR AVN TEST*
📻 *RADIO TEST*

The RWC2010B can generate all kinds of combinations of DAB, DRM, FM-RDS and AM signals, and the affordable RWC2100F can generate multiple FM-RDS and AM signals. The combination of RWC2010B and RWC2100F will be the most cost-effective solution and can provide a complete solution for production systems requiring multi-standard broadcast signals. All testers are controlled via LAN for providing solutions for various scenarios, and are bootable with saved settings without a PC program to be used in fixed production systems.