



Digital Radio for Automotive & Mobile
Wide Area Networks for IoT
Near Field Communication

TEST SOLUTIONS

Aiming the best wireless communication test solution





RedwoodComm

RedwoodComm is a professional developing company for wireless communication test solution.

RedwoodComm develops and provides measurement system for R&D, mass-production of broadcast system and wireless communications such as DAB, DRM, RDS, NFC, BT, GNSS and LoRa technologies.

We will keep making every effort to be the world best company of test & measurement system based on technical know-how and experience of test & measurement system for wireless communications.



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

Overview

RWC2010B Digital Radio Tester supports the DAB, DAB+, DMB, DRM30, DRM+, AM, FM and RDS system. It provides very convenient working environment with full control over all system parameters.



It supports various kinds of data services such as BWS, TPEG, EWS, EPG, SLS and more services will be added to adjust to changing markets. RWC2010B has ETI and MDI file player function so that specific broadcasting station's DAB/DRM signal could be regenerated in the LAB. It also supports AM/FM radio test functions with fully editable RDS test function.

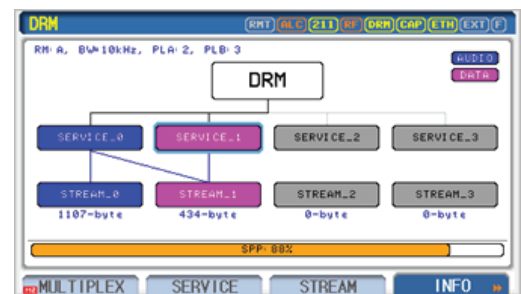
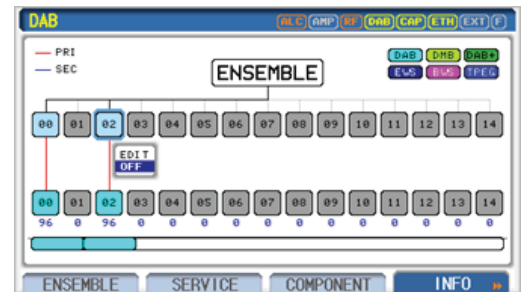
In addition, it includes an RF up-converter, which supports RF output in a range between -10dBm ~ -120dBm (CW: 0dBm ~ -110dBm) with 0.1dB step adjustable and Band LF, MF, HF, I, II, III frequency ranges, so it can directly generate broadcasting signals to DUTs so that systems can be easily aligned.

Key Feature

- Support DAB, DAB+, DMB, DRM30, DRM+, AM, FM, RDS functions
- Built-in Ensemble Multiplexer
 - > Easy and Flexible Ensemble Editing: 15 service components for DAB and 4 streams for DRM
 - > Support various kinds of data services such as BWS, TPEG and so on
 - > Reconfiguration, Announcement, TII, EWS, Time functional tests
- ETI, MDI and DRM IQ file player function with OFDM Modulator and RF up-converter
- Seamless Linking Test
 - > Two RWC2010B testers are connected by data cable and synchronized automatically
 - > Powerful Test functions: DAB-DAB, DAB-DRM, DAM-FM, DRM-FM
- Single Frequency Network (SFN) Test
 - > Two RWC2010B testers can transmit exactly synchronized DAB or DRM signal
 - > Adjustable Signal delay with 0.1us resolution
- Multi-Channel FM & RDS function
 - > Simultaneously up to 3 FM and RDS Radio signals can be generated
- Real-Time File Streaming function
 - > The contents stored in user PC can be transferred to RWC2010B in real-time to broadcast
 - > Useful to test various kind of contents and huge file contents
- Supports various frequency BAND
 - > BAND I/ II/III (47MHz ~ 68MHz, 87MHz ~ 108MHz, 174MHz ~ 250MHz)
 - > LF/MF/HF BAND (0.15MHz ~ 30MHz)

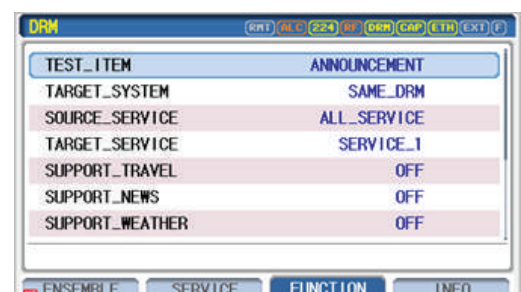
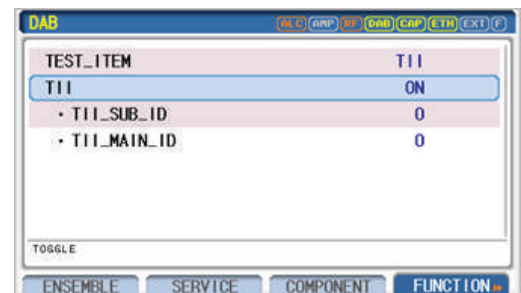
Ensemble Multiplexer

Simple testers consist of pattern player (ETI and MDI file player). Such pattern file has to be prepared in advance on external PC and then downloaded to tester. Protocol compliance tested with several combinations of configuration parameters. Every change in configuration parameters affects test pattern, so pattern file has to be regenerated on external PC and downloaded to tester again. RWC2010B is equipped with Ensemble Multiplexer. It simulates broadcast station functions. Protocol parameters can be edited using GUI program, and updated signal broadcasted immediately. RWC2010B also supports Reconfiguration, TII and announcement functions as well. 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. RWC2010B provides graphical ensemble information screen that can easily capture the imagination of complicate ensemble structure.



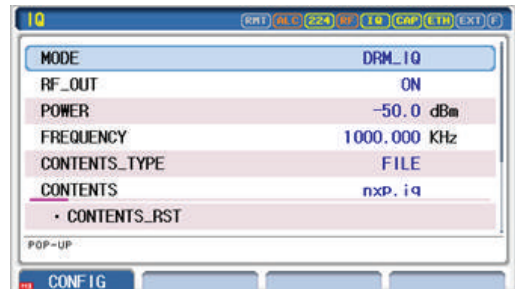
Reconfiguration, Announcement, TII

RWC2010B supports high-tech protocol tests such as Reconfiguration, Announcement and TII. Announcement is a function for a compulsory situation or automation functions. For example, if there is an emergency situation, then an announcement function is activated. 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 the user 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. TII (Transmitter Identification Information) appoints an ID to every transmitter and transmits it through Null space, which is sent for every frame for various applications such as current location checking. TII can be on or off on RWC2010B. Additionally, the ID is changeable and double ID transmission is available. If two IDs are transmitted, the operation environment is also changed as if two transmitters were working at the same time.



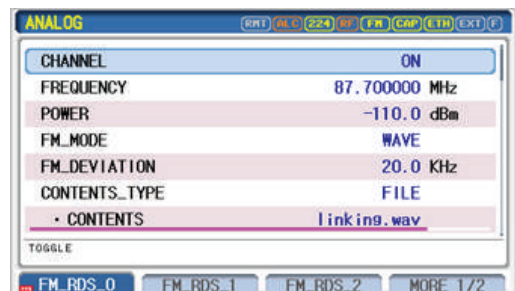
ETI, MDI and DRM IQ File Player

The ETI file describes the characteristics of a signal suitable for transporting a full DAB Ensemble, comprising a number of sub-channels and a formatted Fast Information Channel (FIC), between the DAB Ensemble provider and the Transmission network provider. It means that if the ETI file is recorded specific broadcasting station's T-DMB/DAB signal, it contains all information about that station's. The MDI file describes the characteristics of a signal suitable for transporting a full DRM Ensemble, comprising a number of streams and a formatted Service Description Channel (SDC), between the DRM Ensemble provider and the Transmission network provider. It means that if the MDI file is recorded specific broadcasting station's DRM signal, it contains all information about that station's. Using these files with the RWC2010B's ETI/MDI function, that specific broadcasting station's T-DMB/DAB signal or DRM signal could be regenerated in the LAB.



Analog AM/FM and RDS Test Solutions

RWC2010B supports analog AM/FM and RDS test functions. Most DAB/DMB/DRM DUTs support analog AM/FM features too, then it will be very useful to test not only DAB/DMB/DRM functions but also analog radio functions using one Tester. In case of FM, it supports Multi-channel FM signal generator.



Single Frequency Network (SFN) Test Solutions

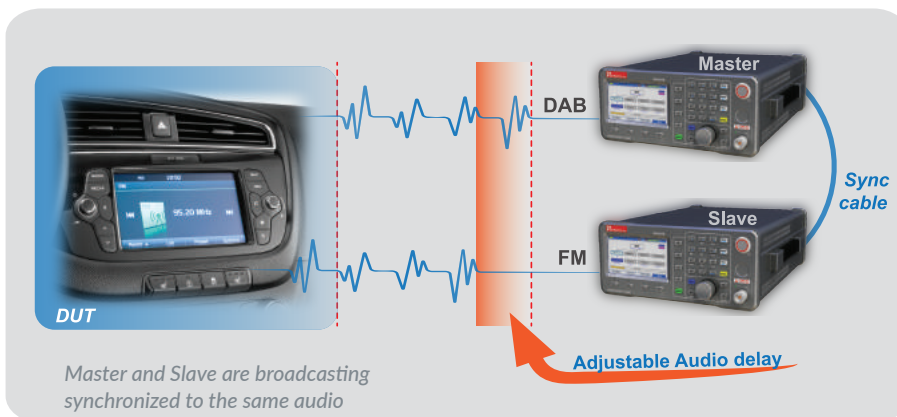
To test SFN in the Lab, two broadcasting emulator are required. And two broadcasting emulator should be synchronized with adjustable sync delay. Using two RWC2010Bs, SFN test can be performed in the Lab very easily.



Seamless Linking Test Solutions

To test Seamless Linking algorithm in the Lab, two broadcasting emulator are required. And two broadcasting emulator should be synchronized with adjustable sync delay. Using two RWC2010Bs, many combination of Seamless Linking test (DAB to DAB, DAB to DRM, DAB to FM, DRM to DRM, DRM to FM) can be performed in the Lab very easily.

User could assign one RWC2010B for Master and the other RWC2010B for Slave. On the Master unit GUI, user can control not only Master unit but also Slave unit. Using the "SLAVE_DELAY" parameter, Audio sync delay between two transmitters are adjustable in ms unit.



Service Linking

Just switching with audio discontinuity

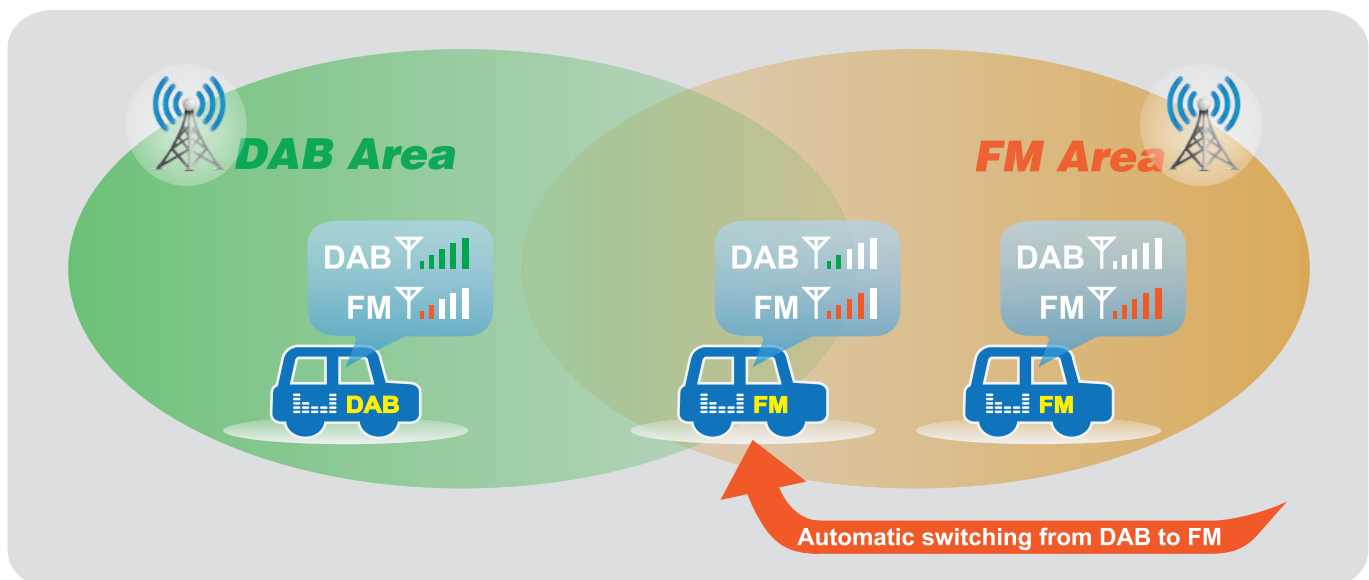
Seamless Linking

Seamless switching without audio discontinuity

Easy Seamless Linking Test using two RWC2010Bs

- One works as a Master and the other works as a Slave
- Provide Audio Time Delay adjustment parameter between two units

Service Linking conceptual diagram



PC Software

Minimum Requirement Test

RWC2010 Utility **SETUP DRM TEST** RWC2010 IP config: 192.168.0.221

STREAMING FILE DOWN UTILITY CONTROL COMMANDER DRM Min.

Minimum Requirement Test Environment for DRM

WANTED SIGNAL
 Frequency: 1000.000 kHz
 Power: -44.0 dBm
 Bandwidth: 9 kHz
 IP Addr: 192.168.0.221

INTERFERER
 Frequency: 1009.000 kHz
 Power: -39.0 dBm
 Bandwidth: 9 kHz
 Set Interferer
 IP Addr: 192.168.0.34

Measurement Environment

```

  graph LR
    G1[1st DRM Signal Generator] --> A1[Variable Attenuator]
    G2[1st DRM Signal Generator] --> A2[Variable Attenuator]
    A1 --> C[Combiner]
    A2 --> C
    C --> AN[Antenna Network]
    AN --> DR[DRM Receiver]
    DR --> BM[BER Meter]
  
```

Test Condition SHOW Comments

7.0 adjacent channel selectivity
 W: CONF:SETUP:POWER -64
 ACK
 W: CONF:SETUP:FREQUENCY 1
 ACK
 W: CONF:DRM:MULTIPLEX:PROTOCOL DRM
 ACK
 W: CONF:DRM:MULTIPLEX:ROBUSTNESS A
 ACK
 W: CONF:DRM:MULTIPLEX:SPECTRUM 9kHz
 ACK
 W: CONF:DRM:MULTIPLEX:HSC_MODE 64QAM
 ACK
 W: CONF:DRM:MULTIPLEX:SOC_MODE 16QAM
 ACK
 W: CONF:DRM:MULTIPLEX:PRT_LEVEL_A 0
 ACK
 W: CONF:DRM:MULTIPLEX:PRT_LEVEL_B 0
 ACK
 W: CONF:DRM:MULTIPLEX:INTERLEAVING SHORT
 ACK

7.2 Analog AM test SET AM AM as an interferer
 7.4 Sensitivity SET LF SET MF SET HF1 SET HF2
 7.5 Dynamic Range SET
 7.6 Adj. CH selectivity SET 1st SET 2nd SET 3rd
 7.7 Far-off selectivity SET
 7.8 Blocking SET LF SET MF SET HF1 SET HF2
 7.9 Co-CH selectivity SET
 7.10 Receiver Linearity SET
 7.11 Rayleigh channel SET No1 SET No2 SET No3 Table4
 SET No4 SET No5 SET No6
 7.12 Acquisition time SET No1 SET No2 SET No3
 SET No4 SET No5 SET No6

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Remote Control Commander

RWC2010 Utility **Commander Mode** RWC2010 IP config: 192.168.0.221

STREAMING FILE DOWN UTILITY CONTROL COMMANDER DRM Min.

DIR: Z:\01_Project\DRM\Release_App\2.50 SAVE OPEN SHOW CMD

```

  1 *IDN?
  2 SLEEP 1000
  3 READ:DAB:ENSEMBLE:TX_MODE?
  4 READ:DAB:ENSEMBLE:REF?
  5 READ:DAB:ENSEMBLE:COUNTRY?
  6 READ:DAB:ENSEMBLE:ECC?
  7 CONF:DAB:SERVICE:PROGRAM @ POP_M
  8 READ:DAB:SERVICE:PROGRAM? @
  9 EXEC:DAB:COMPONENT:CONTENTS_RST @
  10 START_FOR 2
  11 CONF:SETUP:BASIS:POWER -29dBm
  12 READ:SETUP:BASIS:POWER?
  13 SLEEP 2000
  14 CONF:SETUP:BASIS:POWER -100dBm
  15 READ:SETUP:BASIS:POWER?
  16 SLEEP 2000
  17 END_FOR
  18 READ:SETUP:BASIS:POWER?
  19 SLEEP 100
  
```

VERBIFY CLEAR CMD Start Sending STOP Sending CLEAR MSG Sending: 14 line Send Line by Line 1/1 SEND

CMD: *IDN?

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Specifications

Frequency	LF/MF/HF Band : 0.15MHz ~ 30MHz BAND I/II/III: 47MHz~68MHz, 87MHz~108MHz, 174MHz~250MHz Resolution: 1kHz Accuracy: ± 1.5 ppm/year @ operating temperature
Output Level	-10dBm ~ -110dBm (OFDM: -10dBm ~ -120dBm) for BAND I/II/III -20dBm ~ -110dBm (OFDM: -20dBm ~ -120dBm) for LF/MF/HF BAND Resolution: 0.1dB Accuracy: ± 1 dB
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, ± 1.5 ppm/year @ operating temperature External Reference: 10MHz (0dBm ~ +20dBm MAX)
I-Q Out Port	Output voltage: ± 1 Vpp
Remote Programming Ports	RJ45(Ethernet) RS-232C
Miscellaneous	Operating temperature : 5 ~ 40°C Line Voltage : 100 to 240 VAC, 50/60Hz Dimension : 240(W) x 110(H) x 340(D) mm Weight : 5.5Kg



FRONT SIDE VIEW



REAR SIDE VIEW