

Introduction to Digital/Analog Radio Test Solution



DAB/DAB+/DMB



DRM30/DRM+



RDS/RBDS



Analog FM/AM



❖ Digital Radio Tests - Part I

DAB Ensemble Multiplexer

64 Service Components

Easy-to-edit Ensemble structures and parameters

Component Types: DAB/DAB+/DMB/BWS/TPEG/EPG/SLS/SPI

PAD Channels: DLS/DL+/DRC/SLS/SPI

Functional Tests: Reconfiguration, Announcement, AF, TII, Time, etc.

DRM Multiplexer

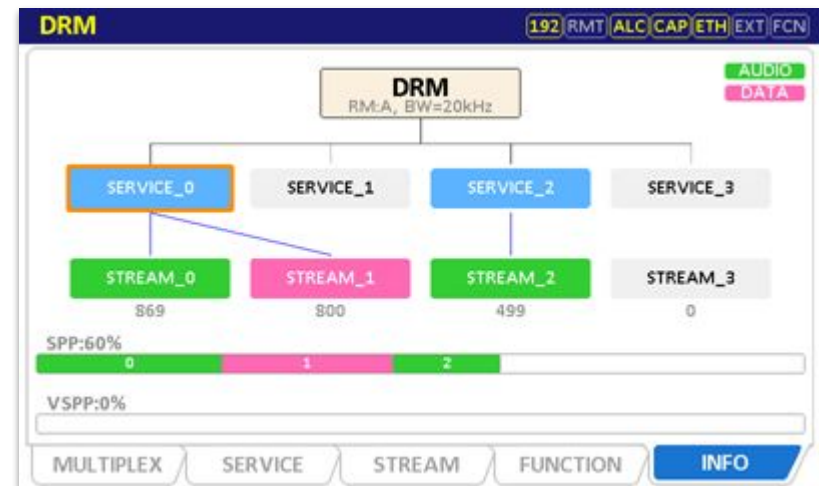
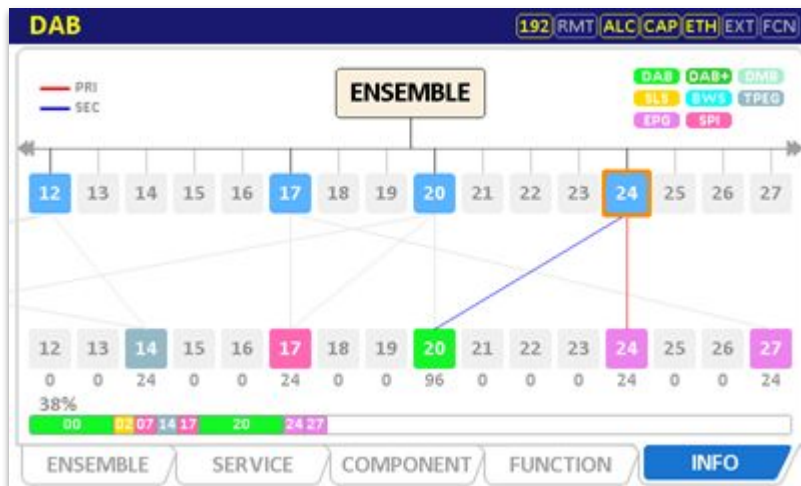
4 Streams

Easy-to-edit Multiplexer structures and parameters

Robustness: DRM30 (A/B/C/D), DRM+ (E)
Spectrum BW (kHz): 4.5, 5, 9, 10, 18, 20, 100

Stream Types: audio/data

Functional Tests: Reconfiguration, Announcement, AF, Time, etc.





❖ Digital Radio Tests - Part II

ETI Player

Playback of the pre-downloaded ETI files

File information screen

Various tone signal files provided

MDI Player

Playback of the pre-downloaded MDI files

File information screen

Various tone signal files provided

DRM30 IQ Player

Playback of the pre-downloaded DRM30 IQ files

ETI						
TX_MODE	NST	N_SRV	EID		LABEL	
0	4	4	0xD111		DAB+ MPS	
SCID	SADR	PTYPE	LEVEL	KBPS	SID	SERVICE LABEL
223	0	EEP	3-A	96	0000D111	No MPS
253	72	EEP	3-A	96	0000D222	MPS 5.1
87	144	EEP	3-A	96	0000D333	MPS 5.1 (other)
117	216	EEP	3-A	96	0000D444	MPS w. 000 Sig.

MDI					
ROBUSTNESS	SPECTRUM	MSC_MODE	SDC_MODE	PRT_A	PRT_B
A	9kHz	64-QAM	16-QAM	0	0
SID	PART A LEN	PART B LEN	LABEL		
0x0003EA	0-byte	553-byte	Redwood_0		
0x00040F	0-byte	277-byte	Redwood_0		

RWC2010C 3/6



❖ Analog Radio Tests

3-channel* FM RDS Transmitter

Mono/Stereo/Sweep/Wave

TMC/TP/TA

AF/EON

RT/RT+/eRT/eRT+

Playback of the pre-stored RDS files

Single-channel AM Transmitter

Mono/Sweep/Wave

* Max ± 3 MHz spacing from FM0 frequency

FM RDS [192] [RMT] [ALC] [CAP] [ETH] [EXT] [FCN]

RF	CHANNEL	ON
MOD	POWER	-50.0 dBm
POWER	FREQUENCY	87.700000 MHz
-50.0 dBm	FM_MODE	STEREO
FREQ	STEREO_MODE	LEFT_AND_RIGHT
87.700 M	AUDIO_FREQ_R	1.00 kHz
	AUDIO_FREQ_L	2.00 kHz
	FM_DEVIATION	50.0 kHz
	AUDIO_VOLUME	100 %

POP-UP

FM RDS 0 FM RDS 1 FM RDS 2 AM

AM [192] [RMT] [ALC] [CAP] [ETH] [EXT] [FCN]

RF	POWER	-50.0 dBm
MOD	FREQUENCY	150.000 kHz
POWER	AM_INDEX	100 %
-50.0 dBm	MODE	MONO
FREQ	AUDIO_FREQ	1.00 kHz
0.150 M		

POP-UP

FM RDS 0 FM RDS 1 FM RDS 2 AM

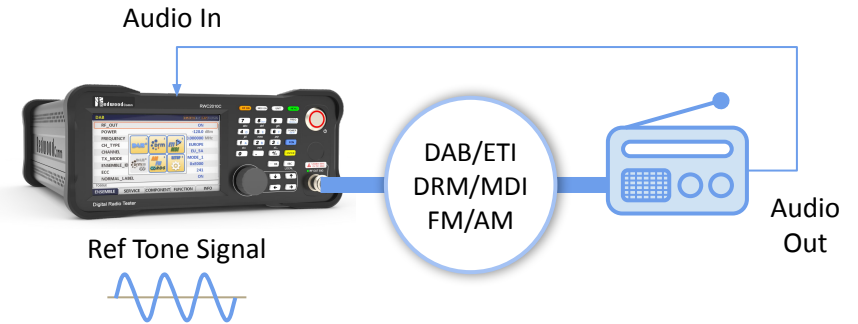
RWC2010C 4/6



❁ Audio Analyzer

Receiver Sensitivity Test

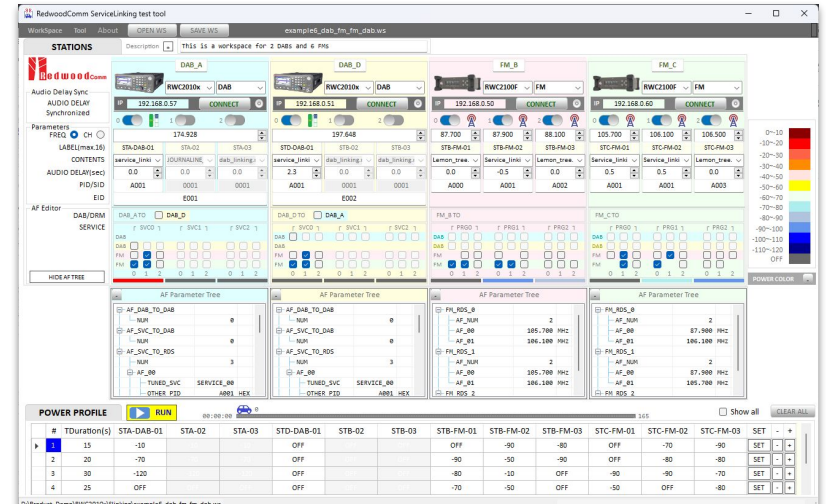
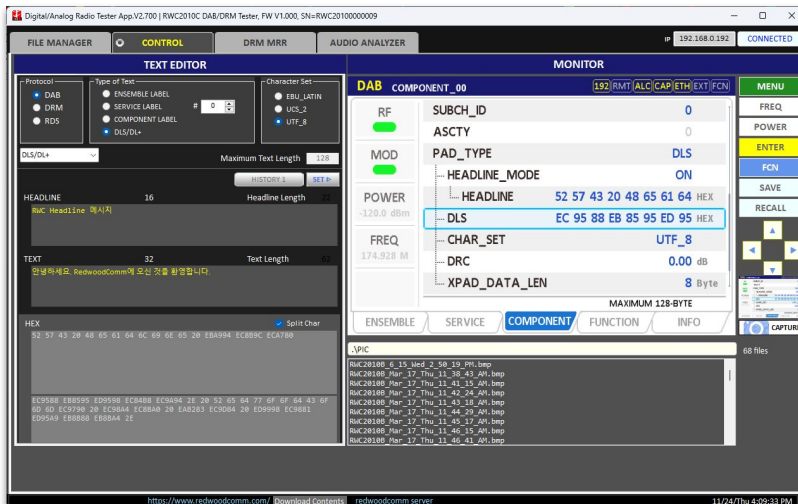
Audio Measurement - SINAD/THDN/SNR



❁ PC Application Software

2010x App - File Downloader / Text Editor / Scripter

Service Linking Test Tool for 2010C(B) and 2100F



RWC2010C 5/6



❖ Frequency Range

Band	Frequency Range
LF/MF/HF BAND	0.149 to 30 MHz
BAND I/II/III	47 to 68 MHz, 76 to 108 MHz, 174 to 250 MHz

❖ Output Level

Band	CW Power	OFDM Power	Power with RWC9500B*
LF/MF/HF BAND	-10 to -110 dBm	-20 to -120 dBm	+15 to -55 dBm (CW/OFDM)
BAND I/II/III	0 to -110 dBm	-10 to -120 dBm	

* RWC9500B : Power Amplifier Module





❖ Ordering Information

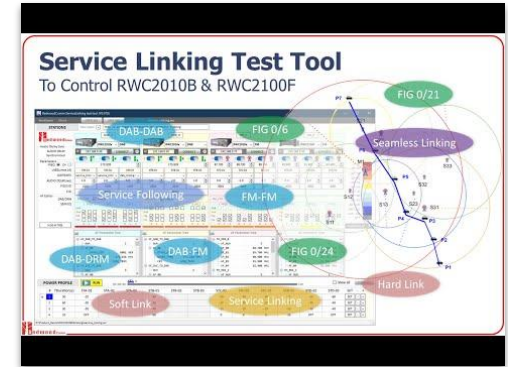
Order Code	Options	Description
C2010C-00	Full Option	DAB/DAB+/ETI, DRM30/DRM+/MDI, RDS/FM/AM
C2010C-01	DAB+DRM	DAB/DAB+/ETI, DRM30/DRM+/MDI
C2010C-02	DAB+Analog	DAB/DAB+/ETI, RDS/FM/AM
C2010C-03	DRM+Analog	DRM30/DRM+/MDI, RDS/FM/AM
C2010C-04	DAB Only	DAB/DAB+/ETI
C2010C-05	DRM Only	DRM30/DRM+/MDI
C2010C-06	Analog Only	RDS/FM/AM
O2010C-01	Add-on	Adding DRM option later
O2010C-02	Add-on	Adding DAB option later
O2010C-03	Add-on	Adding Analog option later
O2010C-04	Add-on	Adding Audio Analyzer option

Order Code	Options	Description
C9500B-00	-	Power Amplifier Module (MF/HF/UHF)

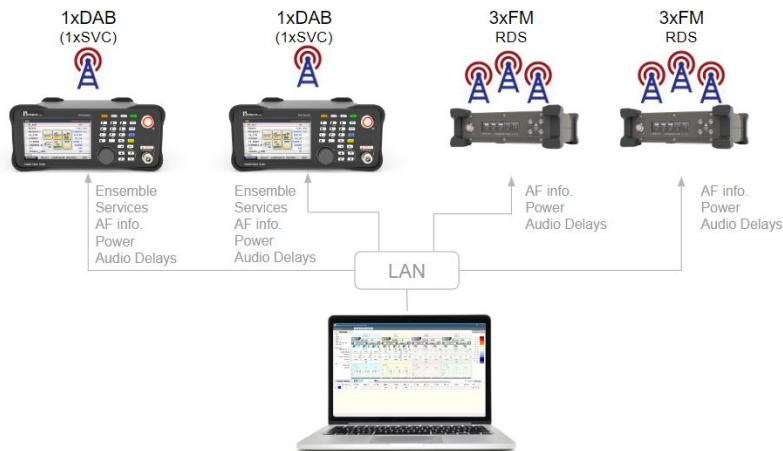
Functional Tests 1/3

Service / Seamless Linking Test

- Emulating up to 4 stations and 12 services
- DAB-DAB, DAB-FM, DRM-FM, DAB-DRM, FM-FM
- Graphical editing of AF information
- Easy test setup with RWC2010B and RWC2100F
- User-configurable "Audio Delays"



RWC2010C(B) and/or RWC2100F



RedwoodComm ServiceLinking test tool (V0.910)

The screenshot shows the main interface of the test tool. It includes a 'STATIONS' section with four stations (DAB_A, DAB_B, FM_C, FM_D) and their respective parameters. Below this is the 'AF Editor' section, which allows for editing the AF parameters for each station. At the bottom, there is a 'POWER PROFILE' table with a 'RUN' button and a 'POWER COLOR' legend.

#	TDuration(s)	STA-01	STA-02	STA-03	STB-01	STB-02	STB-03	STC-01	STC-02	STC-03	STD-01	STD-02	STD-03	SET
1	30	-10			-20			-30	-30	-30	-40	-50	-60	SET
2	60	-30			-30			-20	-20	-20	-10	-30	-40	SET
3	30	-50			-40			-10	-10	-10	-10	-30	-40	SET
4	10	OFF			-50			0	0	0	-10	OFF	OFF	SET

Functional Tests 2/3

❁ Reconfiguration Test

Without Reconfiguration

Modified parameters apply immediately - **may cause discontinuity**

With Reconfiguration

Modified parameters do not apply immediately.
Execute reconfiguration to apply them - changing the multiplexer configuration whilst **maintaining continuity of services**



DAB RECONFIGURATION (023) RMT | ALC | CAP | ETH | EXT | FCN

RF: TEST_ITEM RECONFIGURATION

MODE: ON

MOD: EXECUTE START

DAB (023) RMT | ALC | CAP | ETH | EXT | FCN

RF: CHAR_SET EBU_LATIN

CHAR_FLAG: 0xFF00

MOD: EXTEND_LABEL OFF

PROTOCOL_VER: V1x

POWER: SERVICE_00 ON

SERVICE_01 OFF

SERVICE_02 OFF

SERVICE_03 OFF

SERVICE_04 OFF

FREQ: 174.928 M

TOGGLE

ENSEMBLE SERVICE COMPONENT FUNCTION INFO

edit mode

DAB (023) RMT | ALC | CAP | ETH | EXT | FCN

RF: CHAR_SET EBU_LATIN

CHAR_FLAG: 0xFF00

MOD: EXTEND_LABEL OFF

PROTOCOL_VER: V1x

POWER: SERVICE_00 ON

SERVICE_01 OFF

SERVICE_02 ON

SERVICE_03 OFF

SERVICE_04 OFF

FREQ: 174.928 M

TOGGLE

ENSEMBLE SERVICE COMPONENT FUNCTION INFO

➔

Before Reconfiguration

DAB (023) RMT | ALC | CAP | ETH | EXT | FCN

ENSEMBLE

RF SEC

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

96 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

11%

ENSEMBLE SERVICE COMPONENT FUNCTION INFO

DAB RECONFIGURATION (023) RMT | ALC | CAP | ETH | EXT | FCN

RF: TEST_ITEM RECONFIGURATION

MODE: ON

MOD: EXECUTE PROCESSING

POWER: -20.0 dBm

FREQ: 174.928 M

PUSH AND HOLD

ENSEMBLE SERVICE COMPONENT FUNCTION INFO

DAB (023) RMT | ALC | CAP | ETH | EXT | FCN

RF: CHAR_SET EBU_LATIN

CHAR_FLAG: 0xFF00

MOD: EXTEND_LABEL OFF

PROTOCOL_VER: V1x

POWER: SERVICE_00 ON

SERVICE_01 OFF

SERVICE_02 ON

SERVICE_03 OFF

SERVICE_04 OFF

FREQ: 174.928 M

TOGGLE

ENSEMBLE SERVICE COMPONENT FUNCTION INFO

➔

After Reconfiguration

DAB (023) RMT | ALC | CAP | ETH | EXT | FCN

ENSEMBLE

RF SEC

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15

96 0 96 0 0 0 0 0 0 0 0 0 0 0 0 0

22%

ENSEMBLE SERVICE COMPONENT FUNCTION INFO

Functional Tests 3/3

❁ Announcement Test

Configurable Announcement Support Parameters

Announcement Support Flag
Announcement Support Clusters (up to 5)

Easy Switching Control

Just set the 'AN_SWITCHING' parameter as ON



DAB ANNOUNCEMENT		
RF	SPORTS	ON
	FINANCE	ON
MOD	NUM_OF_CLUSTER	1
	CLUSTER_ID_00	0x1
POWER	AN_SWITCHING	ON
-20.0 dBm	NUM_OF_CLUSTER	1
FREQ	CLUSTER_ID_00	0xFF
174.928 M	AN_SWITCH_TYPE	ALARM
	TARGET_CH	COMPONENT00
TOGGLE		
ENSEMBLE	SERVICE	COMPONENT
FUNCTION		
INFO		



Announcement Test Solution Using RWC2010B





❖ Digital Radio Tests

ETI Player

Playback of the pre-downloaded ETI files

Various tone signal files provided

MDI Player

Playback of the pre-downloaded MDI files

Various tone signal files provided

```
ETI D:192.168.000.022 (AA:OH)INT
FREQ 174.928MHz POW -10.0dBm
FILE TONE_1K_3DBFS.ETI
NSUC 1 / 1 SID 0xE001
LABEL REDWOOD SRV 0
```

```
MDI D:192.168.000.022 (AA:OH)INT
FREQ 1.000MHz POW -10.0dBm
FILE TONE_1K_3DBFS.MDI
ROB A BW 10kHz
MSC 64-QAM SDC 16-QAM
```



❖ Analog Radio Tests

Single-channel FM RDS Transmitter

Mono/Stereo/Sweep/Wave

TMC/TP/TA

AF/EON

RT/RT+/eRT/eRT+

Playback of the pre-stored RDS files

Single-channel AM Transmitter

Mono/Sweep/Wave

```
FM D:192.168.000.022 [AA:OH]INT
FREQ 87.700MHz POW -20.0dBm
MODE STEREO DEV 75.00kHz
LEFT 1.00kHz RIGHT 2.00kHz
RDS REDWOOD.RDS
```

```
AM D:192.168.000.022 [AA:OH]INT
FREQ 558.0kHz POW -20.0dBm
MODE MONO INDEX 100%
AUDIO 1.00kHz
```

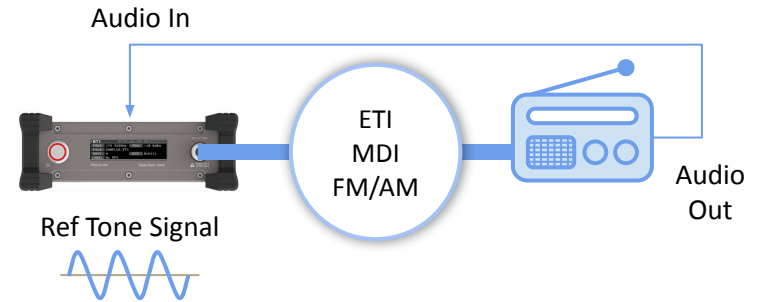
RWC2010M 3/5



❁ Audio Analyzer

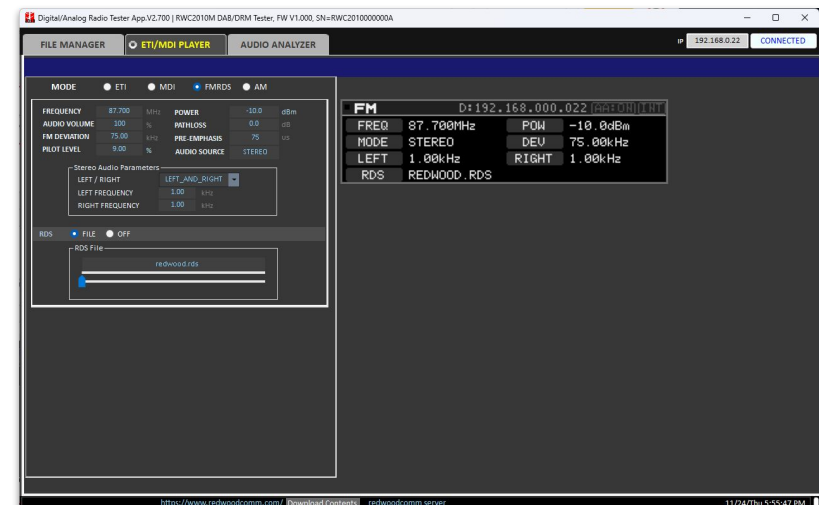
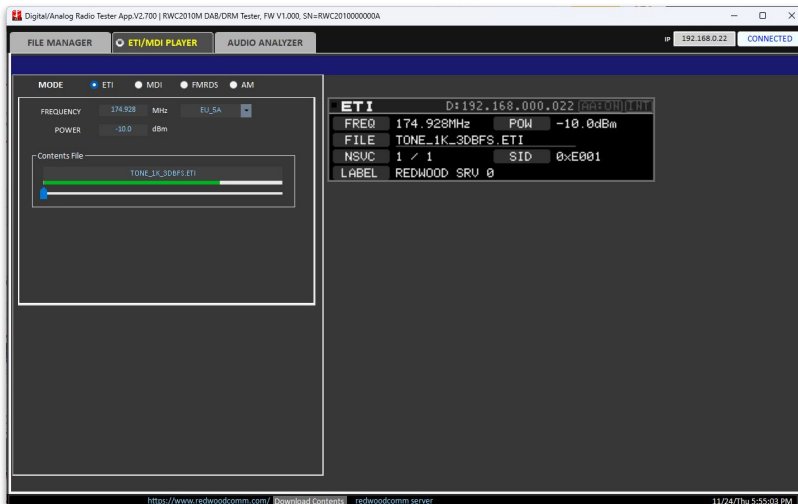
Receiver Sensitivity Test

Audio Measurement - SINAD/THDN/SNR



❁ PC Application Software

2010x App - File Downloader / ETI/MDI Player



RWC2010M 4/5



❖ Frequency Range

Band	Frequency Range
LF/MF/HF BAND	0.149 to 30 MHz
BAND I/II/III	47 to 68 MHz, 76 to 108 MHz, 174 to 250 MHz

❖ Output Level

Band	CW Power	OFDM Power	Power with RWC9500B*
LF/MF/HF BAND	-10 to -110 dBm	-20 to -120 dBm	+15 to -55 dBm (CW/OFDM)
BAND I/II/III	0 to -110 dBm	-10 to -120 dBm	

* RWC9500B : Power Amplifier Module





❖ Ordering Information




Order Code	Options	Description
C2010M-00	Full Option	ETI/MDI File Player, RDS/FM/AM Transmitter
C2010M-01	ETI+MDI	ETI/MDI File Player
C2010M-02	ETI+Analog	ETI File Player, RDS/FM/AM Transmitter
C2010M-03	MDI+Analog	MDI File Player, RDS/FM/AM Transmitter
C2010M-04	ETI Only	ETI File Player
C2010M-05	MDI Only	MDI File Player
C2010M-06	Analog Only	RDS/FM/AM
O2010M-01	Add-on	Adding MDI option later
O2010M-02	Add-on	Adding ETI option later
O2010M-03	Add-on	Adding Analog option later
O2010M-04	Add-on	Adding Audio Analyzer option

Order Code	Options	Description
C9500B-00	-	Power Amplifier Module (MF/HF/UHF)

RWC2010M/C/B Comparison 1/2

MODEL	RWC2010M	RWC2010C	RWC2010B (discontinued)
			
EXTERIOR			
Dimensions	200(W) x 70(H) x 220(D) mm	250(W) x 110(H) x 348(D) mm	240(W) x 110(H) x 340(D) mm
Weight	2.2 kg	5 kg	5.5 kg
Rackmount Installation	Optional		NO
OPERATION			
Stand-alone Mode	Boot by Pre-stored Configuration	YES	
PC Software Application	RWC2010x App		
Remote Control Interface	LAN, RS232		
Control Commands	YES		
DISPLAY			
Type	2.8", 256x64, 16 gray, OLED	5", 800x480, 16M color, TFT LCD	4.3", 480x272, 256 color, TFT LCD
Touch Screen	NO	YES	NO
Status Indication	RF/MOD/Streaming status shown on instrument screen	all parameters shown and editable on instrument screen	
RF OUTPUT			
Port	N-type		
RF On/Off, Modulation On/Off	via PC App only	via PC App or instrument GUI	
Frequency, LF/MF/HF BAND	0.149 to 30 MHz		
Frequency, BAND I/II/III	47 to 68 MHz, 76 to 108 MHz, 174 to 250 MHz		
CW Power @ LF/MF/HF BAND	-10 to -110 dBm		-20 to -110 dBm
OFDM Power @ LF/MF/HF BAND	-20 to -120 dBm		
CW Power @ BAND I/II/III	0 to -110 dBm		-10 to -110 dBm
OFDM Power @ BAND I/II/III	-10 to -120 dBm		
Power with 9500B Power Amp @ all supported bands	+15 to -55 dBm for CW/OFDM		N/A
Power with 9500A Power Amp @ LF/MF/HF BAND	N/A		+0 to -70 dBm for CW/OFDM

RWC2010M/C/B Comparison 2/2

MODEL	RWC2010M	RWC2010C	RWC2010B (discontinued)
			
DAB/DAB+/ETI			
Real-time DAB Multiplexer	NO	YES	
Max # of Service Components	N/A	64	16
ETI File Player	YES		
ETI Files	provided according to customers' requests		
DRM30/DRM+/MDI			
Real-time DRM Multiplexer	NO	YES	
Max # of Streams	4		
MDI File Player	YES		
MDI Files	provided according to customers' requests		
DRM30 I/Q File Player	NO	YES	
RDS/FM/AM			
# of FM/RDS Channels	1	3	
# of AM Channels	1		
RDS Editor	NO	YES	
RDS Transmission	Playback of pre-stored RDS files	as configured in RDS Editor	
EXTERNAL AUDIO IN			
Used as Audio Source in FM	YES		N/A
Audio Analyzer - SINAD/SNR/THDN	YES		N/A
MISCELLANEOUS			
Power Supply	12V/3A DC Adapter provided	100 to 240 VAC	
Internal Storage	256 GB		32 GB
Service Linking Test Support	NO	YES	

* The specifications are subject to change without notice.

V1.12 / Apr 1, 2023

RWC2100F 1/5



❖ Analog Radio Tests - Part I

3-channel FM RDS Transmitter

Independent power control per channel

Mono/Stereo/Sweep/Wave

External Audio In

TMC/TP/TA

AF/EON

RT/RT+/eRT/eRT+

Playback of the pre-stored RDS files (*.rds)

3-channel AM Transmitter

Independent power control per channel

Mono/Sweep/Wave

External Audio In



External "Audio In" to FM transmitter

RWC2100F 2/5



❖ Analog Radio Tests - Part II

Single-channel FM RDS Receiver

RDS information display

RDS data recording



ON RDS RECEIVER AUDIO ANALYZER OFF

FREQUENCY 87.7 MHz VOL 5 RSSI LIST START RECORDING 0 kB PATHLOSS 0.0

RDS REFRESH HOLD UPDATE

BASIC PID 0xE001 ECC 0xE1 PS NAME REDWOOD1 LANGUAGE 0x9 PRG TYPE NEWS PRG TYPE NAME PTY_NAME MUSIC/SPEECH SPEECH PIN 0x841 TIME DATE 2022-11-22 TIME 17:18 LTO 0		-TMC TMC LTN 1 TMC MGS I 0 TMC MGS N 0 TMC MGS R 0 TMC MGS U 0 TMC DIVERSION 0 TMC DIRECTION 0 TMC LOCATION 3084 TMC EVENT 115 TMC EXTENT 0		EON EON PS NAME REDWOOD2 EON PID 0xE002 EON PTY NEWS EON PIN 0 EON TP - EON TA 0 EON AF FRQS 1 87.90 MHz		RT(+) RWC Headline (RT+) RedwoodComm Co., Ltd. (RT+)		eRT(+) RWC Headline (eRT+) RedwoodComm Co., Ltd. (eRT+)	
--	--	--	--	---	--	---	--	--	--

DI MONO/STEREO STEREO ARTIFICIAL HD NOT ART HEAD COMPRESSED NOT COMPRESSED STATIC PTY STATIC PTY		TRAFFIC TP TA		AF MODE A B AF FREQUENCY 2 87.90 MHz 88.10 MHz		TAG(RT+) TAG0 TYPE ITEM_TITLE TAG0 START 22 TAG0 LENGTH 22 TAG1 TYPE ITEM_ARTIST TAG1 START 50 TAG1 LENGTH 10		TAG(eRT+) TAG0 TYPE TAG0 START - TAG0 LENGTH - TAG1 TYPE TAG1 START - TAG1 LENGTH - TEXT DIR LEFT TO RIGHT ENCODING UTF-8	
---	--	-------------------------	--	---	--	--	--	--	--

Raw Data CLEAR

#GRP	A	B	C	D
02A	E001	2038	6F2E	2C20
00A	E001	0032	E204	4F4F
11A	E001	B028	2B2C	264A
01A	E001	1020	00E1	0841
14A	E001	E033	4432	E002

0A	1A	2A	3A	4A	5A	6A	7A	8A	9A	10A	11A	12A	13A	14A	15A
413	300	62	144	5				17		538	80	39		51	

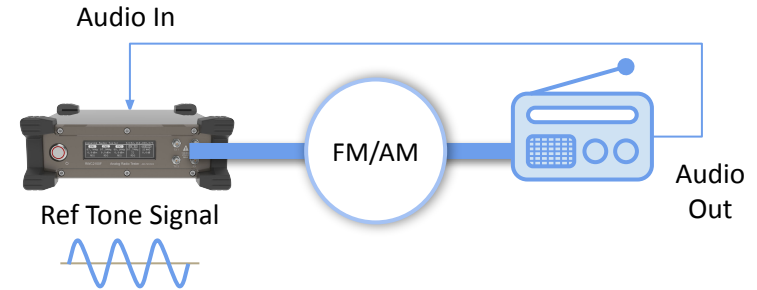
0B	1B	2B	3B	4B	5B	6B	7B	8B	9B	10B	11B	12B	13B	14B	15B
783															

RWC2100F 3/5



Audio Analyzer

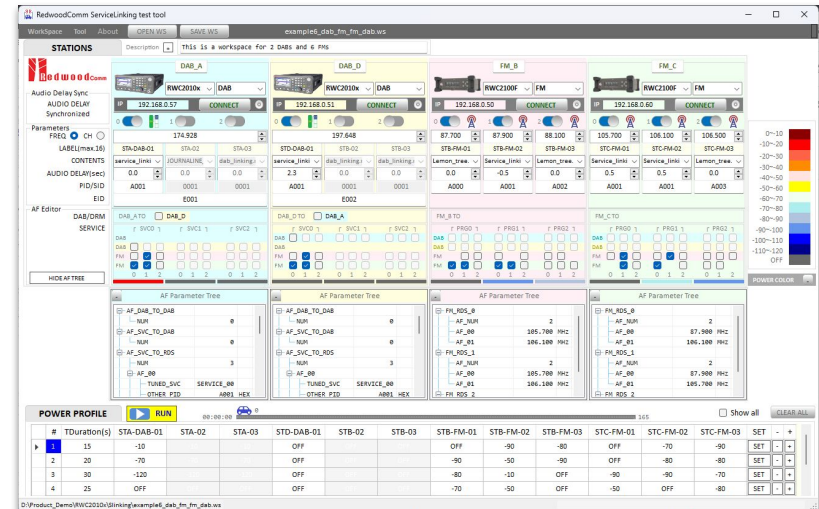
- Receiver Sensitivity Test
- Audio Measurement - SINAD/THDN/SNR
- Audio Spectrum & Waveform



PC Application Software

2100F App - FM/AM TX / RDS RX / Audio / Scripter

Service Linking Test Tool for 2010C(B) and 2100F



RWC2100F 4/5



❖ Frequency Range

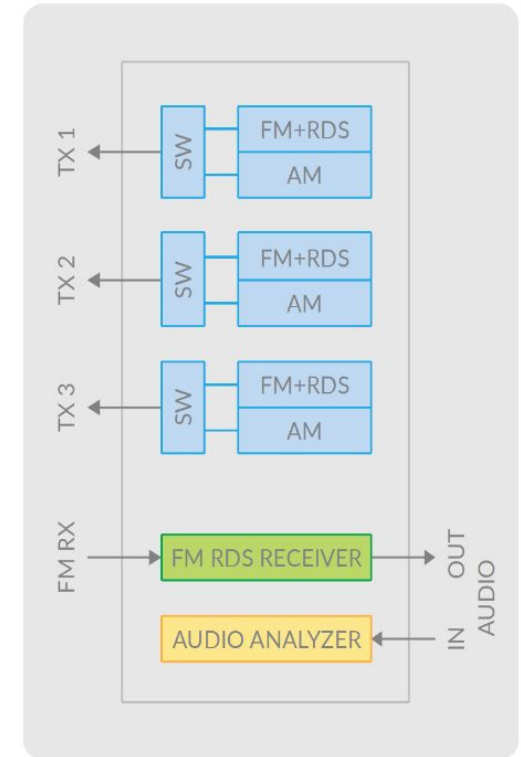
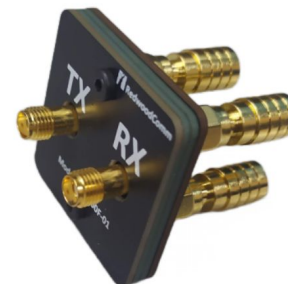
Band	TX Frequency Range	RX Frequency Range
AM BAND	500 to 1,800 kHz	N/A
FM BAND	76 to 108 MHz	76 to 108 MHz

❖ Output Level

Band	Power
AM BAND	-10 to -90 dBm
FM BAND	0 to -90 dBm

❖ 3:1 RF Combiner Module

Band	Path Loss
AM BAND	5.5 dB Typ / 5.8 dB Max
FM BAND	5.2 dB Typ / 5.8 dB Max



RWC2100F 5/5



❖ Ordering Information

Order Code	Options	Description
C2100F-00	Full Option	3 FM RDS or 3 AM Transmitters, RDS Receiver, Audio Analyzer
O2100F-01	RF Combiner	3:1 Combiner for TX Ports

Feedback



If you have any questions,
contact us at sales@redwoodcomm.com or
visit www.redwoodcomm.com.