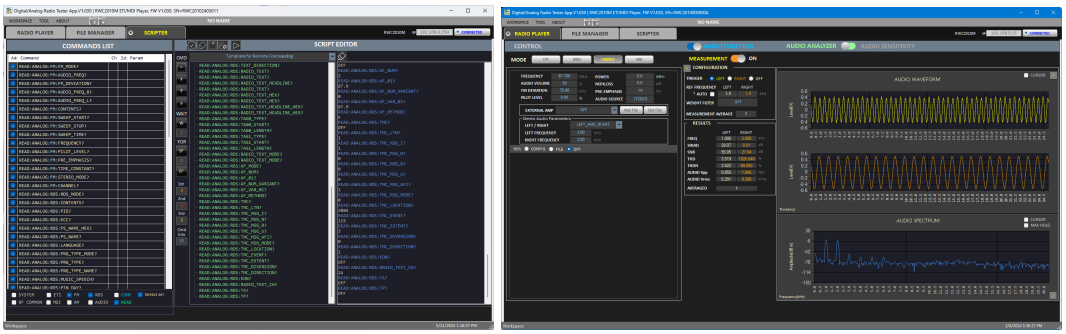
RWC2010M Digital Radio Tester

Operating Manual





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1 General Information

This chapter covers instrument Specifications, Key Features and Safety Consideration.

1.1 Warranty
1.2 Safety Considerations
1.3 General Information
1.4 Power Requirement
1.5 Operating Environment
1.6 Ordering Information

1.1 Warranty

RedwoodComm warrants that this product will be free from defects in materials and workmanship for a period of two(2) years from the date of shipment. During the warranty period, RedwoodComm Company will, at its option, either repair or replace products that prove to be defective.
For warranty service or repair, customers must notify RedwoodComm of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customers shall be responsible for packaging and shipping the defective product to the service center designated by RedwoodComm. Customers shall prepay shipping charge to RedwoodComm designated service center and RedwoodComm shall pay shipping charge to return the product to customer. Customer is responsible for all shipping charges including freight, taxes, and any other charge if the product is returned for service to RedwoodComm, if the customer is located outside of Korea.

LIMITATION OF WARRANTY
The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, accident or abnormal conditions of operations.
RedwoodComm responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. RedwoodComm will not be liable for any indirect, special, incidental, or consequential damages irrespective of whether RedwoodComm has advance notice of the possibility of such damages.

1.2 Safety Considerations

Review the following safety precautions to avoid injury and prevent damage to this product or any product connected to it.

1.2.1 Injury Precautions

Use Proper Power Cord

To avoid fire hazard, use only the power cord specified for this product.

Avoid Electric Overload

To avoid electric shock or fire hazard, do not apply a voltage to a terminal that exceeds the specified range

Ground the Product

This product is grounded through the grounding conductor of the power cord. In case no ground is available at the power outlet, it is recommended to provide a separate grounding path to the instrument

by connecting a wire between the instrument ground terminal and an earth ground to avoid electric shock or instrument damage. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Do Not Operate Without Covers

To avoid electric shock or product damage, do not operate this product with protective covers removed.

Do Not Operate in Wet/Damp Conditions

To avoid injury or fire hazard, do not operate this product in wet or damp conditions.

Do not use in a manner not specified by the manufacturer

1.2.2 Product Damage Precautions

Use Proper Power Source

Do not operate this product from a power source that applies more than the voltage specified. Main supply voltage fluctuations should not exceed ± 10% of the nominal voltage.

Provide Proper Ventilation

To prevent product overheating, provide proper ventilation.

Do Not Operate With Suspected Failures

If there is damage to this product, have it inspected by qualified service personnel.

Environmental Conditions

Refrain from using this equipment in a place subject to much vibration, direct sunlight, outdoor and where the surface is not level. Also, do not use it where the ambient temperature is outside 5 °C to 40 °C, and altitude is more than 2000m. The maximum relative humidity is 80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C. Over voltage Installation Category II for mains supply. Pollution Degree 2

1.2.3 Safety Symbols and Terms

Symbols on the Product

The following symbols may appear on the product

Close



Open



ATTENTION



Indicates earth (ground) terminal

WARNING

Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION

Caution statements identify conditions or practices that could result in damage to this product or other property.

1.3 General Information

ETI (or MDI) files describe the characteristics of a signal suitable for transporting a full DAB Ensemble (or DRM Multiplex), where the ETI comprises a number of subchannels and a formatted Fast Information Channel (FIC) between a DAB Ensemble provider and a transmission network provider, and the MDI comprises a number of streams and a formatted Service Description Channel (SDC) between a DRM Multiplex provider and a 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 the RWC2010M's ETI/MDI player function with these files, specific broadcasting stations' T-DMB/DAB signals or DRM signals can be easily regenerated in labs. The RWC2010M also provides analog functions as AM/FM transmission and audio analyzer. It also provides RDS functionality as a way to play pre-encoded RDS files.

It can be operated stand-alone, and also can be controlled and played with the RWC2010x PC application. The RWC2010x PC application provides various control and measurement functions such as file handling, AM/FM setting, remote controlling and gathering audio measurement data from RWC2010M. Audio measurement data includes SINAD, SNR, THD, waveform and spectrum.

1.3.1 Key Feature

ETI/MDI

- Support ETI/MDI player
- Provide tone ETI/MDI files

FM RDS/AM Transmitter

- Support 1xAM/3xFMRDS transmission
- Support various Audio Modes (MONO / STEREO / WAV File / SWEEP)

Audio Analyzer

- Make it possible to test receiver sensitivity
- Audio measurement: FREQUENCY / SINAD / SNR / THD(N) / AUDIO LEVEL / SEPARATION
- Audio waveform and spectrum

File Play

- Stand alone playable
- PC application controllable

1.3.2 Specification

Frequency

- LF/MF/HF Band: 0.15 to 30MHz
- BAND I/II/III: 47 to 68MHz, 87 to 108MHz, 174 to 250MHz
- Resolution: 1kHz
- Accuracy: ±1.5ppm/yr @ operating temperature

Output Level

- 0 to -110dBm (OFDM: -10 to -120dBm) for BAND I/II/III
- -10 to -110dBm (OFDM: -20 to -120dBm) for LF/MF/HF BAND
- Resolution: 0.1dB
- Accuracy: ±1dB

Output Level with RWC9500B (optional)

- +15 to -55dBm (CW/OFDM)
- Resolution: 0.1dB
- Accuracy: ±1dB

Audio Analyzer Characteristics

- Input Frequency: 0.1 to 20 kHz
- Input Range: Single Ended 2.25 Vrms
- Bandwidth: 20 kHz
- SNR: >85 dB

- SINAD: >75 dB
- THD: <0.01 %
- Connection Type: Balanced RCA (L+/L-/R+/R-)

VSWR

- Better than 1:1.5

Frequency Reference

- Internal Reference & Stability: 10MHz, ±1.5ppm/yr @ operating temperature
- External Reference Input: 10MHz, 0 to +20dBm MAX.

Data IO Port

- Ethernet for Remote: RJ45
- RS232 for Remote: D-sub 9

Miscellaneous

- Operating temperature: 5 to 40℃
- DC Power: 12V/3A VDC
- Dimension: 200(W) x 70(H) x 220(D) mm
- Weight: 2.2kg
- Display: 2.8” gray OLED
- Internal storage: 256GB

** The specifications are subject to change without notice.*

1.4 Power Requirement

This Tester is a portable instrument and requires no physical installation other than connection to a power source. The manufacturer does not take any responsibility for problems that occur when the adapter provided with the product is not used.

Items	Specifications
Input voltage	12V/3A VDC
Input current	1.50A
Power Consumption	Less than 20 watt

CAUTION: If AC power is beyond the range of operation, the equipment may malfunction or could be permanently damaged. Main supply voltage fluctuations should not exceed ±10% of the nominal voltage.

1.5 Operating Environment

Refrain from using this equipment in a place subject to much vibration, direct sunlight, outdoor and where the flat is not level. Also, do not use it where the ambient temperature is outside 5 °C to 40 °C, and altitude is more than 2000m.

The maximum relative humidity is 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C. Over voltage Installation Category II for mains supply. Pollution Degree 2.

The storage temperature range for this equipment is –20 °C to 70 °C. When this equipment is not used for a long period of time, store it in a dry place away from direct sunlight, covered with vinyl or placed in a cardboard box.

1.6 Ordering Information

C2010M-00: Digital Radio Tester - Full Option
ETI/MDI Player, RDS/FM/AM Transmitter

C2010M-01: Digital Radio Tester - ETI+MDI
ETI/MDI Player

C2010M-02: Digital Radio Tester - ETI+Analog
ETI Player, RDS/FM/AM Transmitter

C2010M-03: Digital Radio Tester - MDI+Analog
MDI Player, RDS/FM/AM Transmitter

C2010M-04: Digital Radio Tester - ETI Only
ETI Player

C2010M-05: Digital Radio Tester - MDI Only

MDI Player

C2010M-06: Digital Radio Tester - Analog Only

RDS/FM/AM Transmitter

2. Basic Operation

This section describes the basic concepts and details of operating RWC2010M ETI/MDI Player. Understanding the basic concepts of your RWC2010M helps you use it effectively.

2.1 Exterior
2.2 Screen Layout
2.3 Operation
2.4 Managing Content files
2.5 Scripter
2.6 Firmware Upgrade

2.1 Exterior

2.1.1 Front Panel View

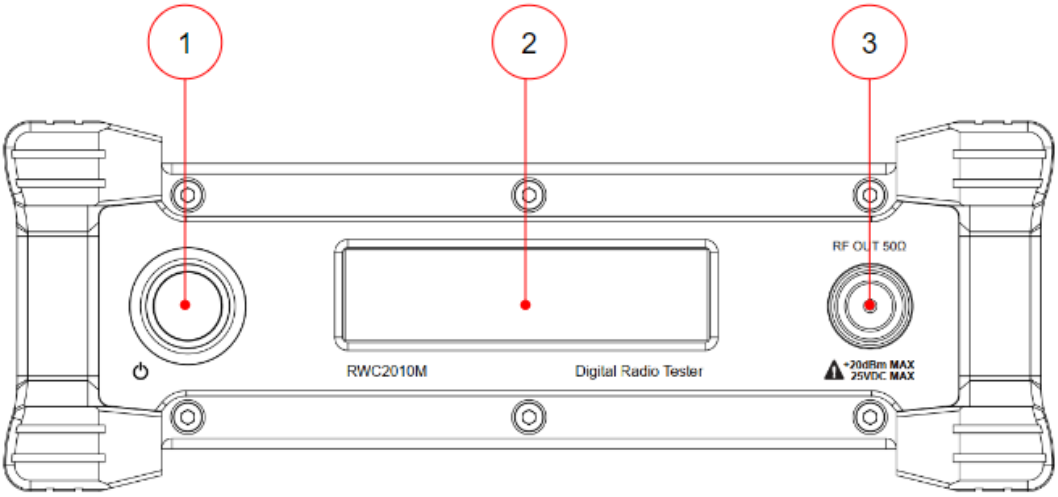


Fig. RWC2010M Front Panel View

1. POWER ON/OFF SWITCH
2. 2.8” Grayscale OLED
3. N-type RF OUT Port

2.1.2 Rear Panel View

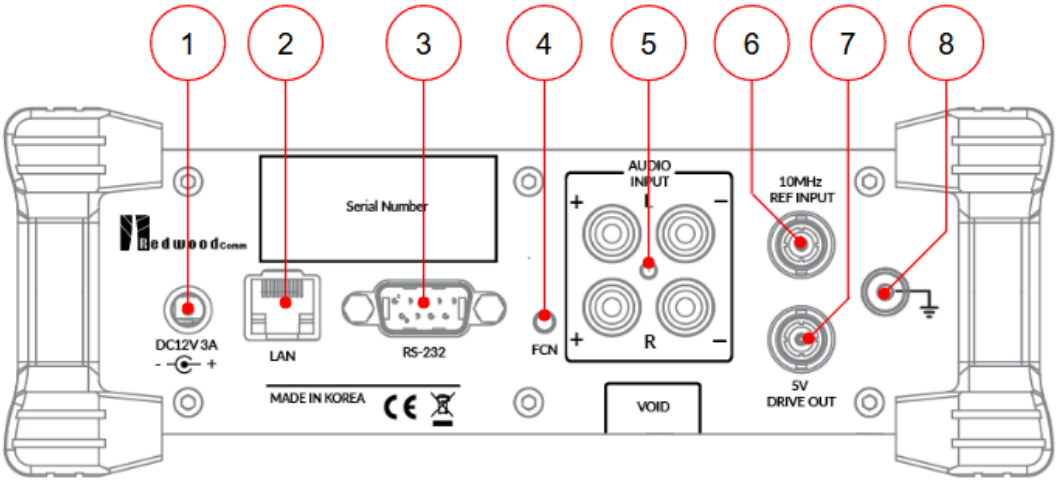


Fig. RWC2010M Rear Panel View

1. 12V DC power input
2. RJ45 connector
3. RS232 male connector
4. Function button
5. Audio In (RCA L+/L-/R+/R-)
6. 10MHz input BNC
7. 5V Drive Out for External Control (100mA Max)
8. GND Terminal

2.2 Screen Layout

2.2.1 Booting Screen

When the power is turned on, the FW version and serial number are displayed as shown in the screen below.



Fig. Booting Screen

2.2.2 Information

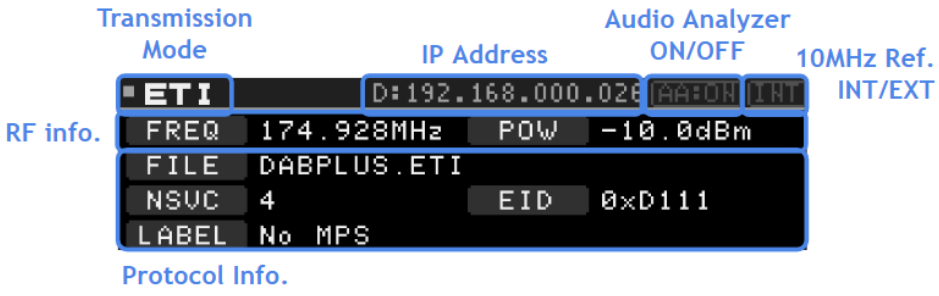


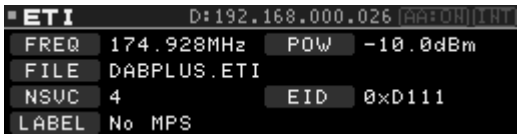
Fig. Screen Layout

Common Information

Transmission MODE	ETI/MDI/FM/AM
Frequency	Transmission Frequency MHz

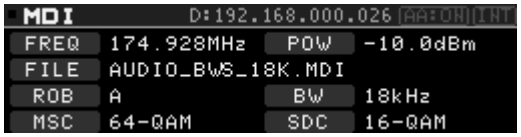
Power	Transmission Power dBm or dBuV
IP Address	IP4 D:123.123.123.123 D:Dynamic S:Static
AA ON/OFF	Audio Analyzer ON/OFF status
INT/EXT	INTernal or EXTernal 10MHz reference use

ETI Mode



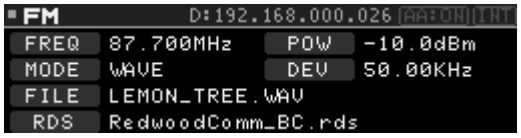
ETI	Transmission mode
FILE	Playback content file
NSVC	Number of service
EID	Ensemble ID
LABEL	SERVICE LABEL, rotationally display

MDI Mode



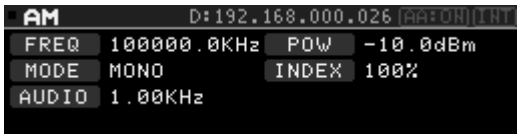
FILE	Playback content file
ROB	Robustness Mode A,B,C,D,E
BW	Signal Bandwidth 4.5/5/9/10/18/20 kHz
MSC	Modulation method for Main Service Channel
SDC	Modulation method for Service Description Channel

FM Mode



MODE	MONO / STEREO / SWEEP / WAVE
DEV	FM Deviation
AUDIO FREQUENCY	Left / Right audio frequency kHz
SWEEP CONDITION	START - STOP / STEP kHz
WAVE FILE NAME	playback .wav filename stored in RWC2010M
RDS	playback .rds filename stored in RWC2010M

AM information



MODE	MONO / SWEEP / FILE
AUDIO FREQUENCY	audio signal frequency kHz
SWEEP CONDITION	START - STOP / STEP kHz
INDEX	Modulation Index 1-100%
WAVE FILE NAME	playback .wav filename stored in RWC2010M

Audio Analyzer

ON/OFF	ON / OFF status
SNR	Signal to Noise Ratio, Left/Right, Unit dB
SINAD	Signal to Noise and Distortion Ratio, Left/Right, Unit dB
THDN	Total Harmonic Distortion and Noise, Left/Right, Unit %

2.2.3 Setup parameters

RWC2010M, a dongle type device, does not have any console key, so direct parameter setting through the device is impossible. Even RF basic parameters such as frequency and power must be set through the PC application. However, in case of standalone operation, the last setup values are saved and recalled when booting, so it can be used repeatedly without setting parameters.

2.3 Operation

When booting, RWC2010M automatically operates in the last setting mode and setting conditions and outputs RF transmission signals. We define a mode that works without a PC application as standalone.

RWC2010M can be used while controlling it with a PC application software which controls through Ethernet or RS232. Users can control it with users' own designed software, remote commands.

2.3.1 Operation Mode of RWC2010M Equipment

RWC2010M supports ETI/MDI player and FM-RDS/AM transmission mode. All transmission modes operate one mode at a time. Refer to Chapter 3 for more detail.



Fig. Transmitter Mode Selection

2.3.1.1 ETI Player

It plays ETI files. The ETI file must be saved in RWC2010M internal storage.

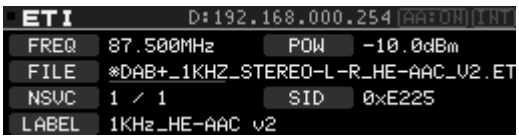


Fig. ETI Player Mode

2.3.1.2 MDI Player

It plays MDI files. The MDI file must be saved in RWC2010M internal storage.

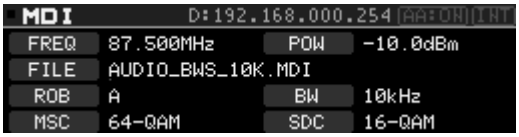


Fig. MDI Player Mode

2.3.1.3 FM Generator

Select Mode to generate tone or select WAV file to transmit as FM modulated signal. In order to transmit the WAVE file, the wave file must be saved in the internal storage of RWC2010M. At this time, the RDS signal can be simultaneously transmitted by selecting the RDS file.

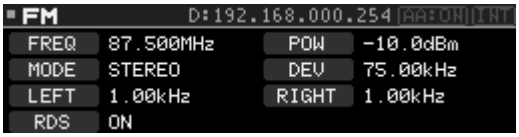


Fig. FM Generator Mode

2.3.1.4 AM Generator

Select Mode to generate tone or select WAV file to transmit AM modulated signal. In order to transmit the WAVE file, the wave file must be saved in the internal storage of RWC2010M.

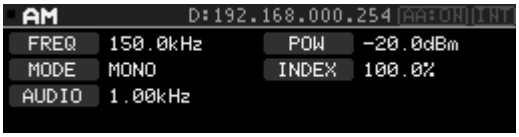


Fig. AM Generator Mode

2.3.1.5 Audio Analyzer

RWC2010M provides audio analyzer function. This measures the audio signal input to the RCA(L+/L-/R+/R-) on the rear panel of RWC2010M. Since it is independent of the transmitter, it can be operated concurrently with other modes (ETI, MDI, FM, or AM). To use Audio Analyzer, you need to activate the function using PC software. You can see the [AA:ON] indication on the screen of RWC2010M. Refer to Chapter 4 for more detail.

2.3.2 Controlling with PC Software

RedwoodComm provides RWC2010M PC application program for RWC2010M control. Users can use RWC2010M to download content files, delete downloaded files, set play mode, and perform tasks such as ETI/MDI play and FM-RDS/AM transmission. Also, if the Audio Analyzer option is included, you can control the Audio Analyzer and save audio data using the application. In addition, standalone mode of RWC2010M and related parameters can be set.

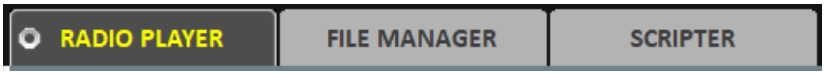


Fig. Menus of the RWC2010M PC Application



Fig. The control screen of the RWC2010M PC application

2.3.2.1 Workspace Functions

The RWC2010M application program saves all control and protocol parameters to a workspace file. To handle the workspace, the application must be connected to the RWC2010M equipment. After connection, all workspace functions are activated. This means that without a connection with the equipment, you cannot operate the equipment properly and cannot create nor open a workspace. It is recommended to operate the equipment after saving the workspace for user convenience.

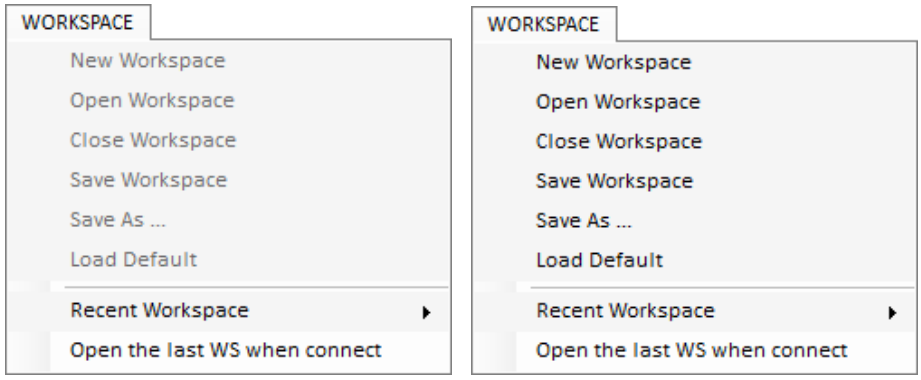


Fig. Menus for Workspace

New Workspace

It creates a new workspace. You can see the name of the created file at the top of the application. The full path of the workspace is displayed at the bottom of the application. You can also create a workspace by clicking [new] button .

Open Workspace

It opens an existing workspace file.

Close Workspace

It closes the opened workspace. After closing, the workspace name will be “NO NAME”.

Save Workspace

It saves the opened workspace without asking for a new name. If you click the [Save Workspace] without opening or creating a workspace, the Workspace File Naming dialog box opens.

If the parameters are changed, an asterisk appears in the workspace name, such as "my_workspace.ws *".

You can also save your workspace by clicking the [Save] button .

Save As

It saves the current workspace with a new workspace name.

Load Default

It sets all parameters with factory's default values.
Be careful to use this function. The loaded parameters cannot be recovered to the previous ones.

Recent workspace

It saves and shows the last opened workspaces. You can open the one of listed files by clicking file name in the list. The maximum number is seven.

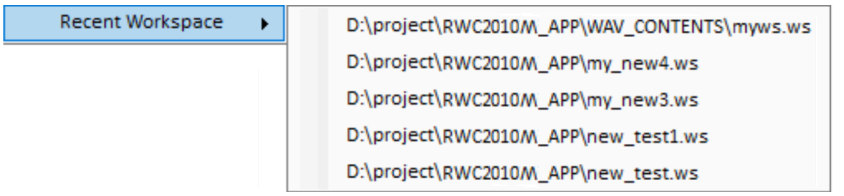


Fig. Recent workspaces list

Open the last WS when connect

If this option is checked, it opens the last workspace when you connect the application to RWC2010M equipment.

2.3.2.2 Tools

There are 4 tool menus such as Save RWC2010M Params To, Recall RWC2010M Params From, Boot By, and Remote Switch Mode. All functions are related to SAVE and RECALL. The SAVE and RECALL functions allow you to store different instrument setups and retrieve them later. By saving test setups, you can save time by eliminating the task of re-configuring the RWC2010M. RWC2010M supports up to 10 save/recall sets.

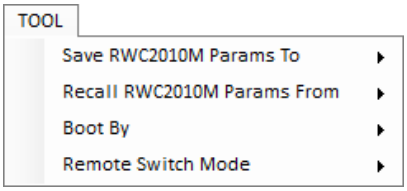


Fig. Tool functions

SAVE RWC2010M Params To

Make any changes to the instrument that you want to SAVE in a memory. By selecting any SAVE_xx, you can make RWC2010M save all parameters to the selected named item.

Recall RWC2010M Params From

It makes RWC2010M retrieve all parameters from the selected item. Selecting RESET makes RWC2010M reset as factory parameters.

Boot by

RWC2010M provides a Boot By function so that it can be used alone without a PC. When restarting the system, one of the Saved configurations will be retrieved.

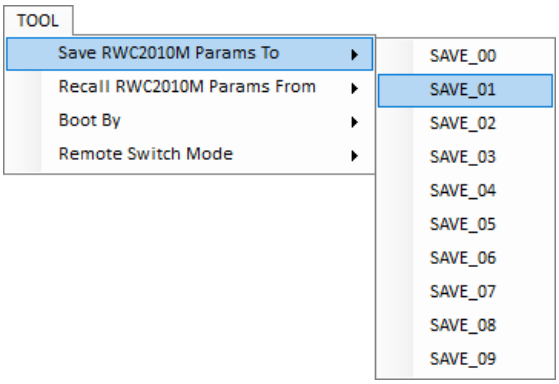


Fig. Save parameters to RWC2010M

Remote Switch Mode

The RWC2010M offers a way to use the recall function through external devices such as switches. These external devices can only use the four predefined commands: RMT:KEY_1, RMT:KEY_2, RMT:KEY_3, and RMT:KEY_4. At this time, the RWC2010M allows for a choice between two remote switch modes: DIRECT and NAVIGATION.

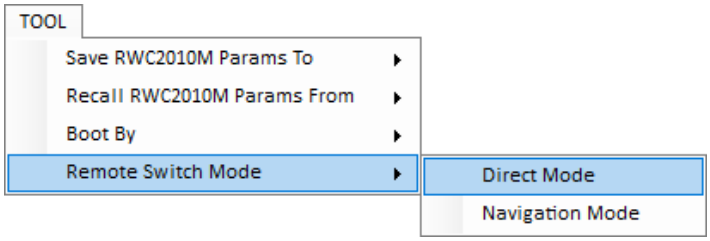


Fig. Remote Switch Mode

DIRECT Mode

RMT:KEY_x commands are mapped sequentially to SAVE_xx. For example, RMT:KEY_1 is mapped to SAVE_00, RMT:KEY_4 to SAVE_03. When a remote switch box sends RMT:KEY_1, RWC2010M recalls SAVE_00 parameters.

NAVIGATION Mode

RMT:KEY_1 selects and recalls the previous item of the currently selected SAVE_xx, while RMT:KEY_4 selects and recalls the next item of the currently selected SAVE_xx. For example, when SAVE_03 is recalled and the external switch box sends the RMT:KEY_1 command, RWC2010M recalls the SAVE_02 parameter.



Fig. External remote switch (example)

2.3.2.3 About

Manual

The PC application program manual is to guide users how to use the application program, the RWC2010M equipment and remote commands.

The release note informs the release history and issues of the application and RWC2010M equipment.

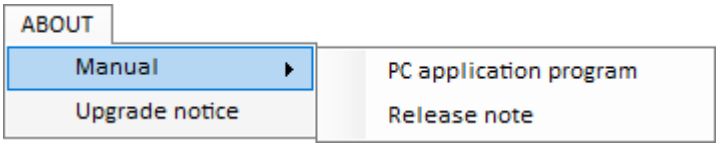


Fig. Opening the manual

Upgrade Notice

It shows the latest version information of the application.

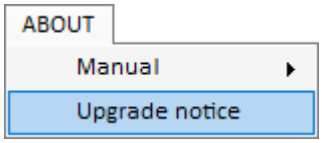


Fig. Upgrade notice

2.4 Managing Content Files

When RWC2010M operates as an ETI/MDI player or FM/AM transmitter, the necessary files (ETI, MDI, RDS, WAV) depending on the mode are called content files.

The content files stored in the internal storage space of RWC2010M can be downloaded from the RWC file server to the user's PC at any time using the RWC2010x application, and can also be downloaded to the RWC2010M internal storage.



Fig. File manager menu

You can jump to the File Manager window by clicking the [File Manager] button.
Before managing files, you must connect the application to the RWC2010M because the file manager handles the files located at RWC2010M equipment. With this function, users can download or delete wave or RDS files into RWC2010M equipment. After connecting the application to RWC2010M, It gathers and shows the information of the files saved into RWC2010M internal disk.
All application functions such as FM/AM transmitter, RDS receiver, and audio analyzer must be stopped before starting the file manager.

2.4.1 File Functions

Downloading File(s)

Using the download button , you can download wav files and radio data service files you dumped with the function of RWC2010M for saving RDS data. You can select multiple files using mouse drag action.

Deleting File(s)

Using delete button , you can delete files one by one.

Formatting Storage

Using format button , you can format the RWC2010M's internal storage.
Be careful with file deleting and disk formatting. Deleted files and a formatted storage cannot be recovered. The filename must be written in English.

Compatibility of Files

The type of wave file must be a 44.1kHz sampled file.
The RDS file must be 8 bytes grouped ASCII formatted as [E001 A431 4E41 4D45]

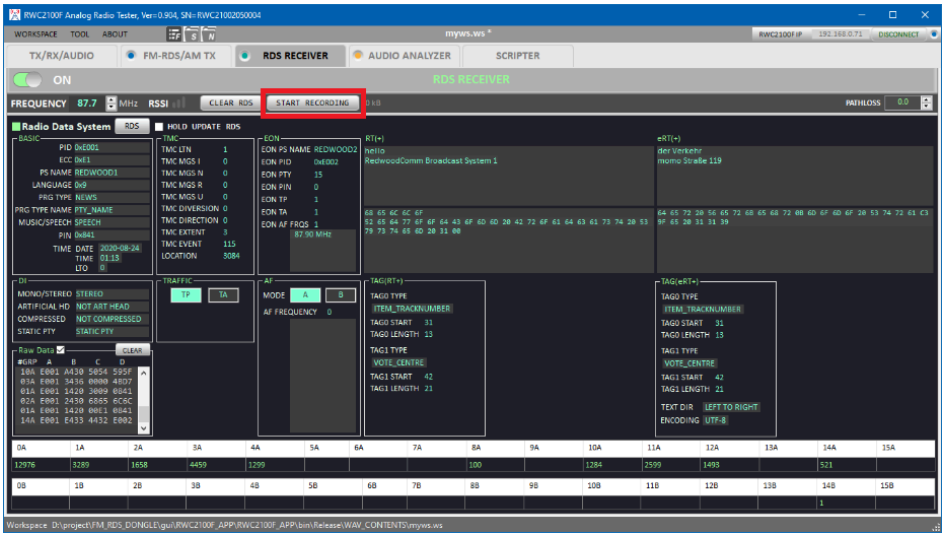
2.4.2 ETI, MDI, WAV files

ETI, MDI, and WAV files created or owned by the user can be downloaded to RWC2010M using the RWC2010x PC application.

Please refer to chapter 2.4 to know how to download content files for detail.

2.4.3 RDS files

In the case of RDS files, due to compatibility issues, the user's own files cannot be used. The RDS files provided by RedwoodComm can be used, or dumped ones using the **RWC2100F** sold by RedwoodComm can be used.



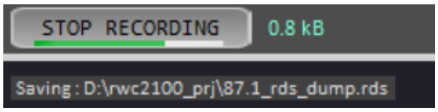


Fig. Recording RDS data using RWC2100F PC Application software

2.4.4 Downloading files from RedwoodComm's Server

Click the UPDATE LIST button of SERVER, then the FILE MANAGER will update the file list.

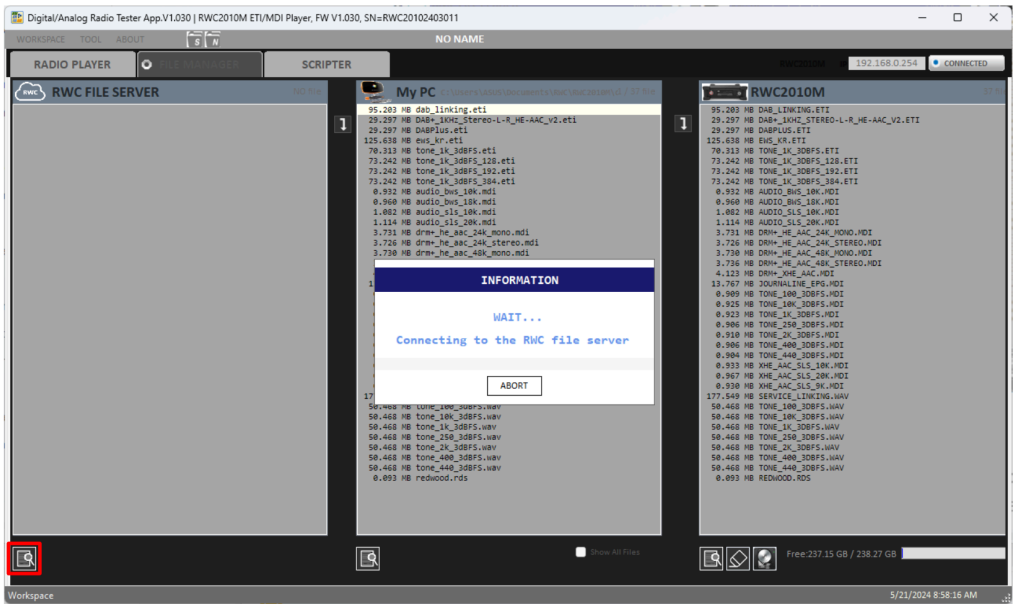


Fig. Updating file list of RWC file server

Users can download content files from the server to the users' PC by clicking the DOWNLOAD button 1. All Files are selective. The FILE MANAGER shows duplicate files between server and PC with highlighted background color after selecting files.

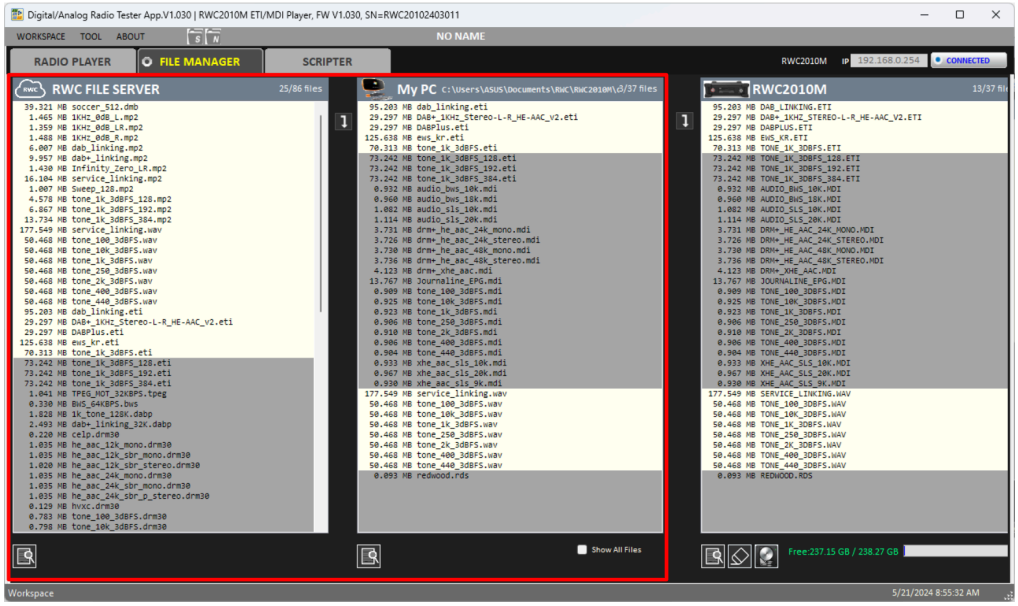


Fig. Getting content files from RWC file server

2.4.5 Downloading files from PC to RWC2010M

Click the “UPDATE LIST” button of the PC before starting to download, then the FILE MANAGER will update the file list of the user PC. Users can download files from the PC to the RWC2010M by clicking the DOWNLOAD button 1. All Files are selective. The FILE MANAGER shows replicated files between the PC and the RWC2010M with highlighted background color after selecting files.

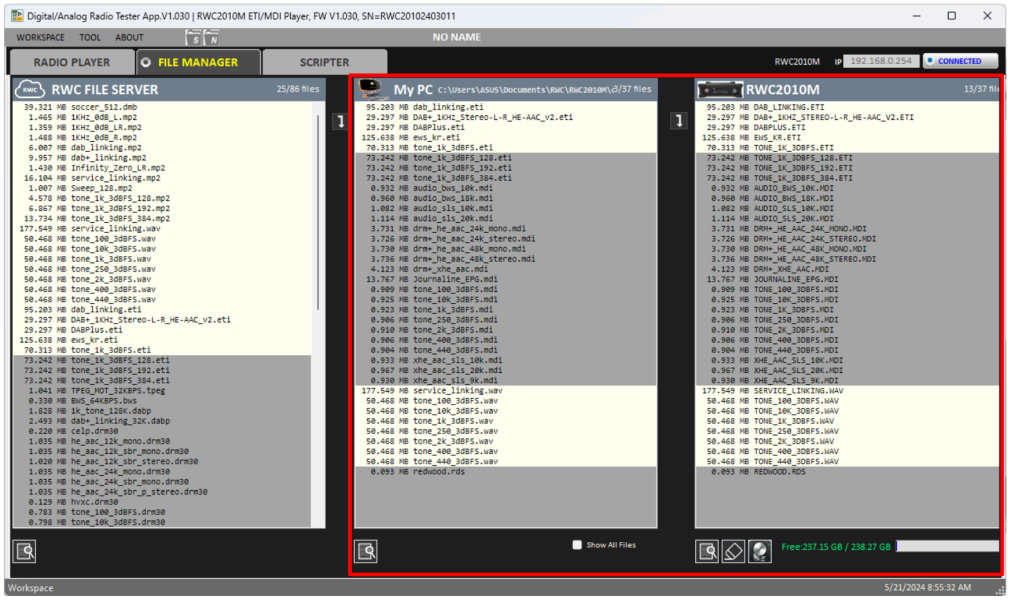


Fig. Downloading content files from User pc to RWC2010M equipment

2.4.6 Internal Storage

RWC2010M has 256 GBytes internal storage. All types of content files are saved in it. The free space of the internal storage is displayed in the FILE MANAGER tab.



Fig. Free space information of the internal storage

2.5 Scripter

This function provides a method to create a scenario that sends commands sequentially. Users can add, remove, or edit RWC2010M’s remote commands and special syntax such as WAIT, FOR_START, and END_FOR.



Fig. File manager menu

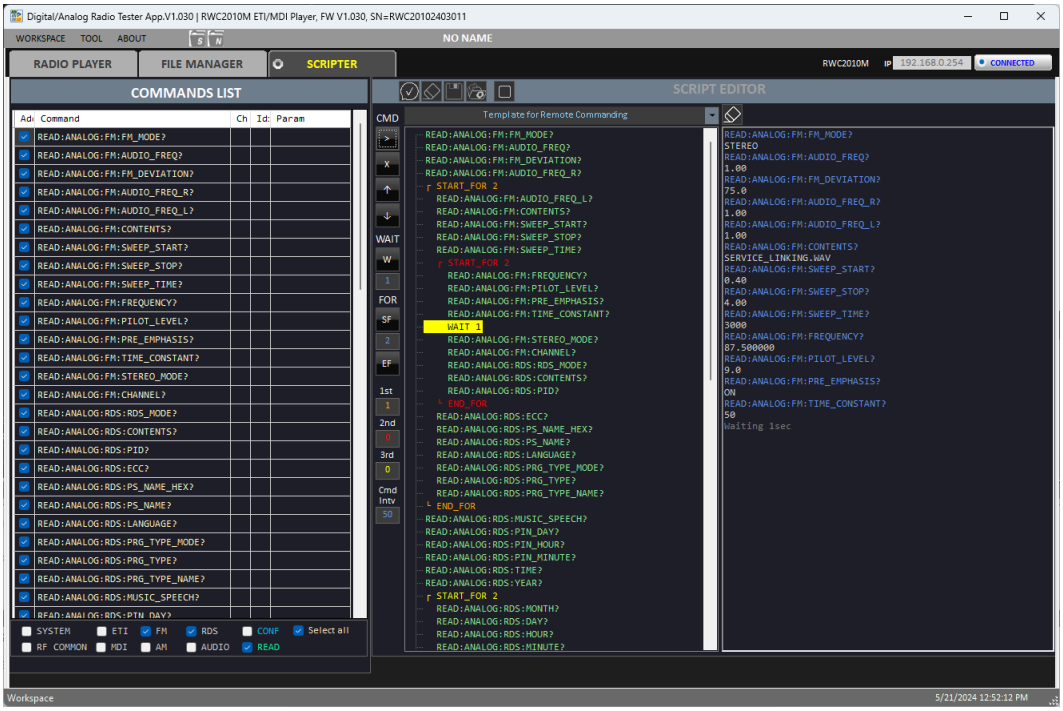


Fig. Scripter function

2.5.1 Command Editor

2.5.1.1 Selection commands

To add commands to the editor, you must select it from the command list. You can select all commands by checking the 'Select All' check, or you can select one by one.

2.5.1.2 Filtering commands

To filter commands, select the filter option check box and only commands of the desired class are listed.

Filtering option

□ SYSTEM: Filtering option to list system related commands
□ RF_COMMON: Filtering option to list common RF related commands
□ TX FM: Filtering option to list TX FM-RDS related commands
□ TX AM: Filtering option to list TX AM commands
□ RX RDS: Filtering option to list RX RDS related commands
□ AUDIO: Filtering option to list audio analyzer related commands
□ CONF: Filtering option to list configuration commands
□ READ: Filtering option to list reading commands

The □ CONF and □ READ options are '&&' operation with other options.

oad Default

2.5.2 Script Editor

2.5.2.1 Addition of commands

If you click the add [+] button , then all selected commands will be added to the script editor.

2.5.2.2 Deletion of a command

To delete a command, click [x] button or [DEL] key of your keyboard.

2.5.2.3 Movement of a commandcript editio

To move a command, click the [Up] or the [Down] button or use dragging and dropping with your mouse.

2.5.2.4 Edition of a command

A mouse clicking makes you edit the command.

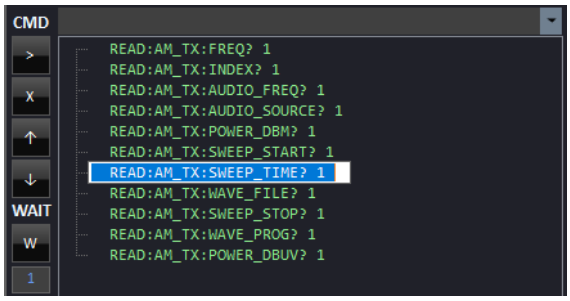


Fig. Example of editing a command

2.5.2.5 Addition of a wait action

By clicking the button [W], you can add a WAIT action in the second unit. It makes the scripter wait for the specific time before sending the next command.

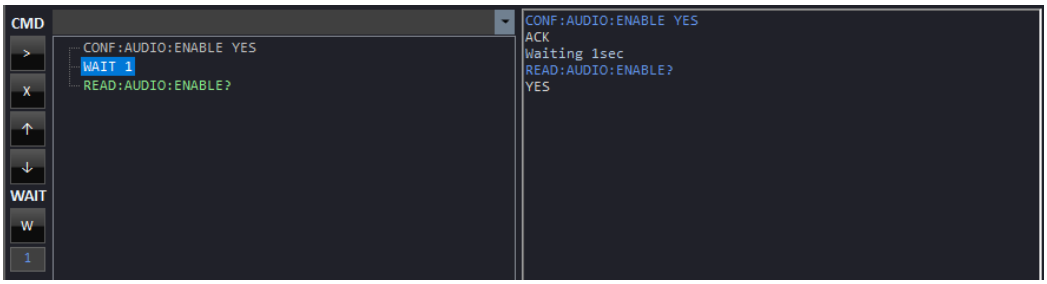


Fig. Example of adding a 'wait 1' syntax

2.5.2.6 Addition of a FOR action

Clicking [Start For] SF button adds a START_FOR action. You can change the number of for iteration by modifying iteration value 3.

You must add an END_FOR syntax by clicking [End For] EF button. The number of START_FOR and END_FOR syntax must be the same. The maximum START_FOR and END_FOR syntax set is three.

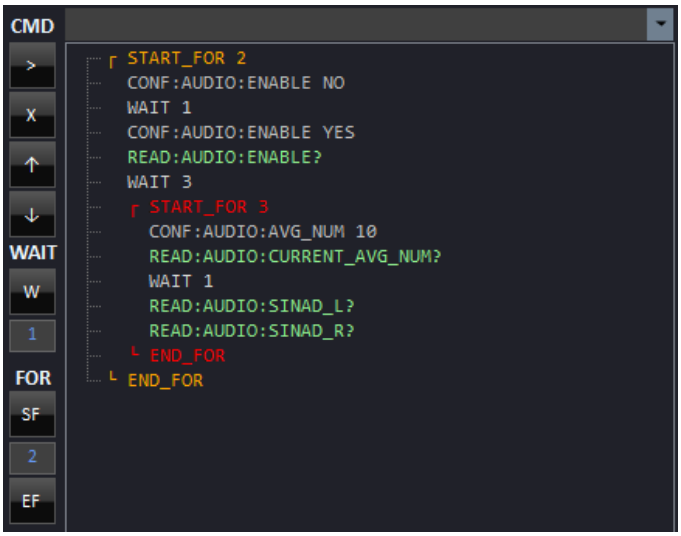


Fig. Example of Script editing

2.5.2.7 Run a script

Clicking the [RUN] button RUN will make RWC2010M send the listed commands to RWC2010M. Before running the script, RWC2010M must be connected with the application. The time interval is configurable by users. Users can set the time interval by modifying the value of 'CmdIntv' in ms units. The yellow color box means the current running command or action.

2.5.2.8 Saving a Script

You can save the script to keep what you have edited. After modifying your script, click the [Save] icon

and select a folder and specify the file name to save it.

2.5.2.9 Opening a Script

You can recall the saved script you edited previously. Click the open icon and select a saved file.

2.5.2.10 Clearing a Script

To clear the all commands you added, Just click the erase icon . Be careful when deleting, as cleared commands cannot be recovered.

2.5.2.11 Template for remote commanding

RWC2010M application provides template for remote commanding. If you select one of the templates, it will add template commands to the scripter automatically.

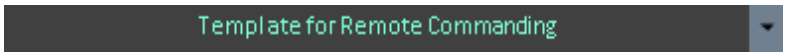


Fig. Template box

2.6 Firmware Upgrade

As RWC2010M adapted Flash Memory, it is available to upgrade easily by using the PC without changing the Hardware. For upgrading, RWC2010M Application Program shall be used. The program is provided together with the product and it is available to download the upgrade data from RedwoodComm Website or provide it via post-mail. The information for upgrading shall be kept in providing to the user via email or website.

2.6.1 Normal Firmware Upgrade

Setup Ethernet connection between RWC2010M and RWC_upgrader.exe

The download sequence is as follows. For the next processing, click the NEXT button.

- Execute RWC_upgrader.exe
- Click the CONNECT button for the recognition the RWC2010M
- Upgrader will find the valid equipment, and check the version of equipment and bin file
- Click the NEXT button for confirming upgrade
- A confirming window will pop up again to make sure of the download.
- Upgrading firmware will be starting
- After downloading the binary file, reboot the RWC2010M

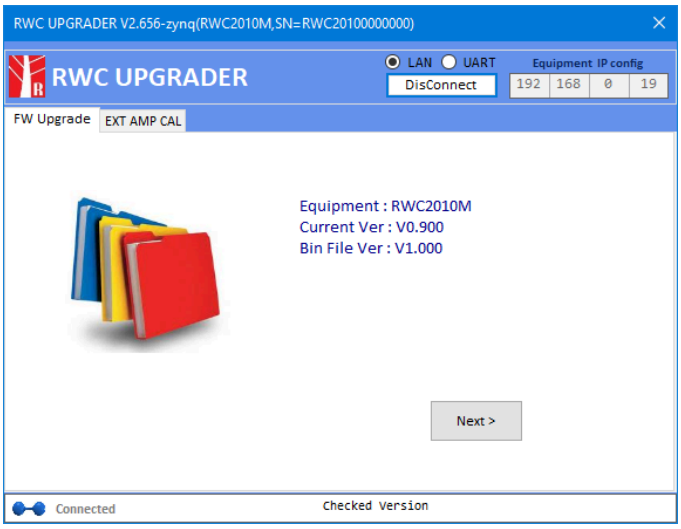


Fig. RWC UPGRADER Screen

2.6.2 Emergency Firmware Upgrade Sequence

Failing of Normal Upgrading can affect or disable RWC2010M. In this case, the RWC2010M should be booted in Emergency Upgrade mode.

If the normal program behaves abnormally and cannot be upgraded with the Upgrader program, the normal program must be deleted for emergency booting. To delete the normal program, please keep pressing the FCN key on the rear panel, and turn the RWC2010M power ON. RWC2010M will ask if you want to delete normal programs. Please reboot the RWC2010M after deleting the normal program for emergency upgrade mode.

Repeat the upgrading sequence from the beginning.

3. Transmission Mode

RWC2010M provides ETI/MDI/FM/AM transmission mode.
Users can select one of them using RWC2010x application software. And control all parameters according to the selected transmission mode.

3.1 ETI Play Mode
3.2 MDI Play Mode
3.3 FM Generation
3.4 AM Generation

3.1 ETI Play Mode

ETI stands for Ensemble Transport Interface. In the ETI/MDI player tab of RWC2010x application software, users can set the RWC2010M as an ETI player. Using this function, the user can generate almost the same as a real Ensemble signal in the Lab. RWC2010M supports not only ETI(NI, G703) but also ETI(NI, V11).



Fig. ETI Player Selection

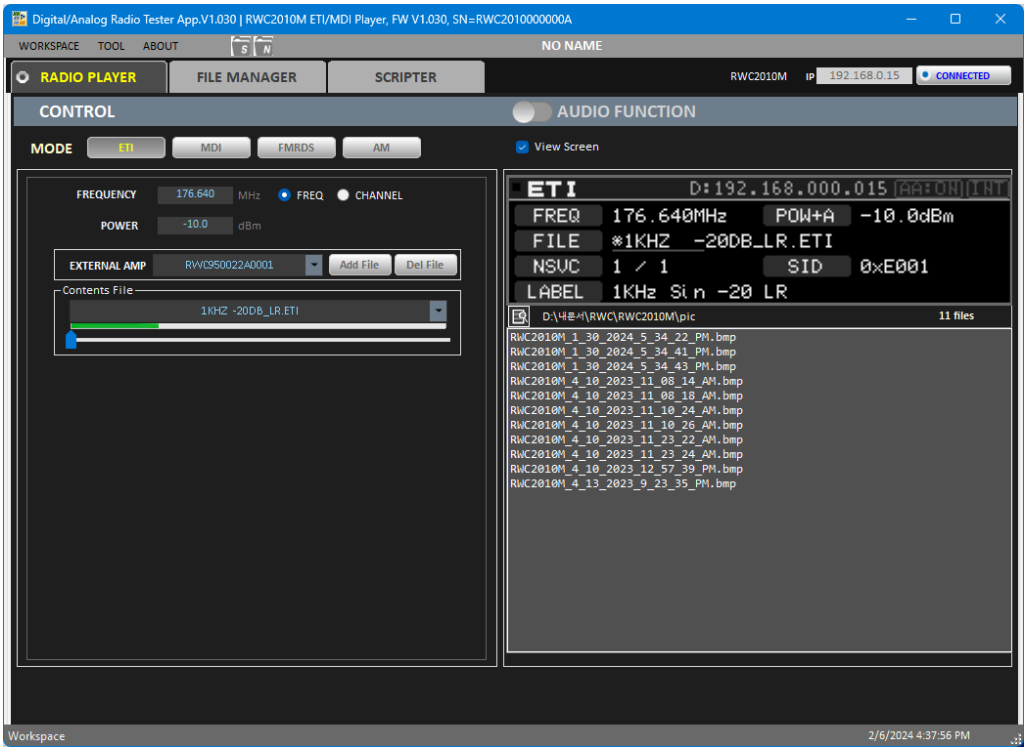


Fig. ETI Setup Screen

3.1.1 ETI File Transmission

RWC2010M operates as an ETI file player. Users can not modify ETI file parameters but just play with ETI compatible files by selecting a file from the Contents File window.
Users control the starting position of the playback file by scrolling the progress bar or by modifying the "MOVE TO" value.

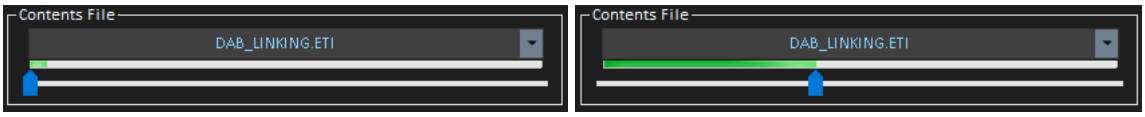


Fig. Moving file play position

Users can directly change the RF frequency or use the DAB channel name for the EU region.

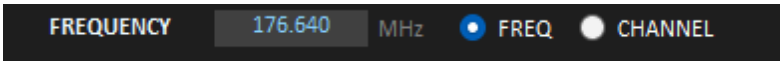


Fig. Setting Frequency by modifying frequency



Fig. Setting Frequency by modifying the Channel name

3.1.2 ETI Contents File

To play ETI files, set the test mode as ETI by clicking the ETI radio button. Then ETI file playing is started automatically. Select desired ETI contents file using the "CONTENTS file" combobox. RWC2010M shows the selected content file(.eti) on the screen.



Fig. ETI Contents File window

While the ETI is transmitting, you can check the file information and status such as TX Mode, Ensemble ID, and Service Label on the screen.

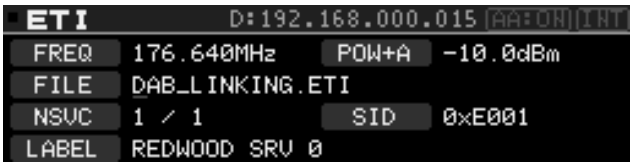
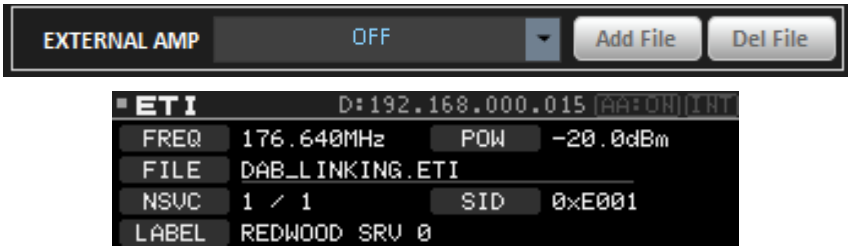


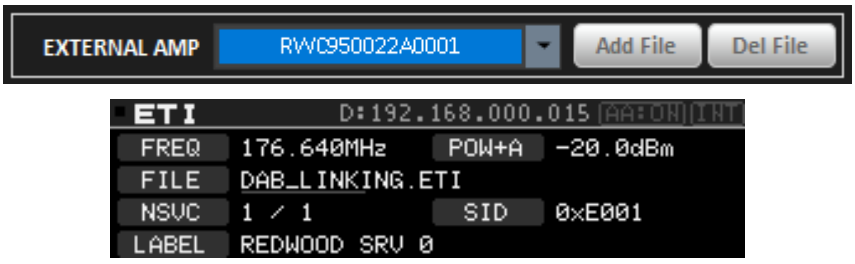
Fig. ETI Player Information Screen

3.1.3 External Amplifier on/off

The RWC2010M has a maximum output power of -10 dBm for OFDM and 0 dBm for single tone. To obtain higher output power, the RWC9500B Power module from RedwoodComm can be connected externally. If the RWC9500B is connected externally, the amp_cal data must be loaded into the RWC2010M to compensate for the power difference, and this operation must be enabled/disabled by the user. When selecting EXTERNAL AMP as OFF, "POW" will be displayed on the RWC2010M screen, and when selecting the calibration file for the EXTERNAL AMP, "POW+A" will be displayed on the RWC2010M screen. The External Amplifier on/off function is applied and displayed uniformly across all operating modes.



When the EXTERNAL AMP is not connected, select "OFF."



When the EXTERNAL AMP is connected, select an EXTERNAL AMP file

The EXTERNAL AMP calibration file provided by RedwoodComm, and can be added or removed by the user from the RWC2010M. In the case of an invalid file, it will be ignored and not displayed on the screen, so it is essential to use the valid file provided by RedwoodComm.

3.2 MDI Play Mode

Using this function, the user can generate almost the same as a real DRM signal in the Lab.



Fig. MDI Player Selection

3.2.1 MDI File Transmission

RWC2010M operates as an MDI file player. To play MDI files, set the test mode as MDI by clicking the MDI radio button.
Users can not modify MDI file parameters but just play with MDI compatible files. Users control the starting position of the playback file by scrolling the progress bar or by modifying the “MOVE TO” value.

3.2.2 MDI Content Files

To play MDI files, set the test mode as MDI by clicking the MDI radio button.Then DMI file playing is started automatically. Select desired MDI contents file using the “CONTENTS file” combobox. RWC2010M shows the selected content file(.mdi) on the screen.
While the MDI is playing, you can check the file information and status such as Robustness Mode, Spectrum BW, Label, etc.



Fig. MDI Player Information Screen

3.3 FM Generation

The RWC2010M provides an Analog Mode for comprehensive FM/AM testing. The standard FM mode supports Mono, Stereo, Sweep, and Wave File Player modes for single-channel testing.

In addition, the FM x 3 Mode enables simultaneous generation of up to three independent FM/RDS signals. Each channel (Channel 1, Channel 2, and Channel 3) operates independently with dedicated RF parameters,

audio generator settings, and RDS data configurations.

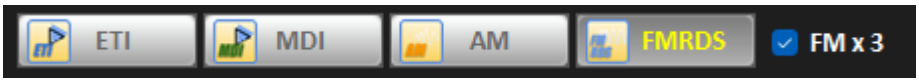


Fig. FM Mode Selection

To activate multi-channel generation, select the [FM x 3] checkbox in the protocol selection bar on the CONTROL tab. Once activated, the main screen displays three identical channel control panels arranged horizontally (Channel 1, Channel 2, and Channel 3).

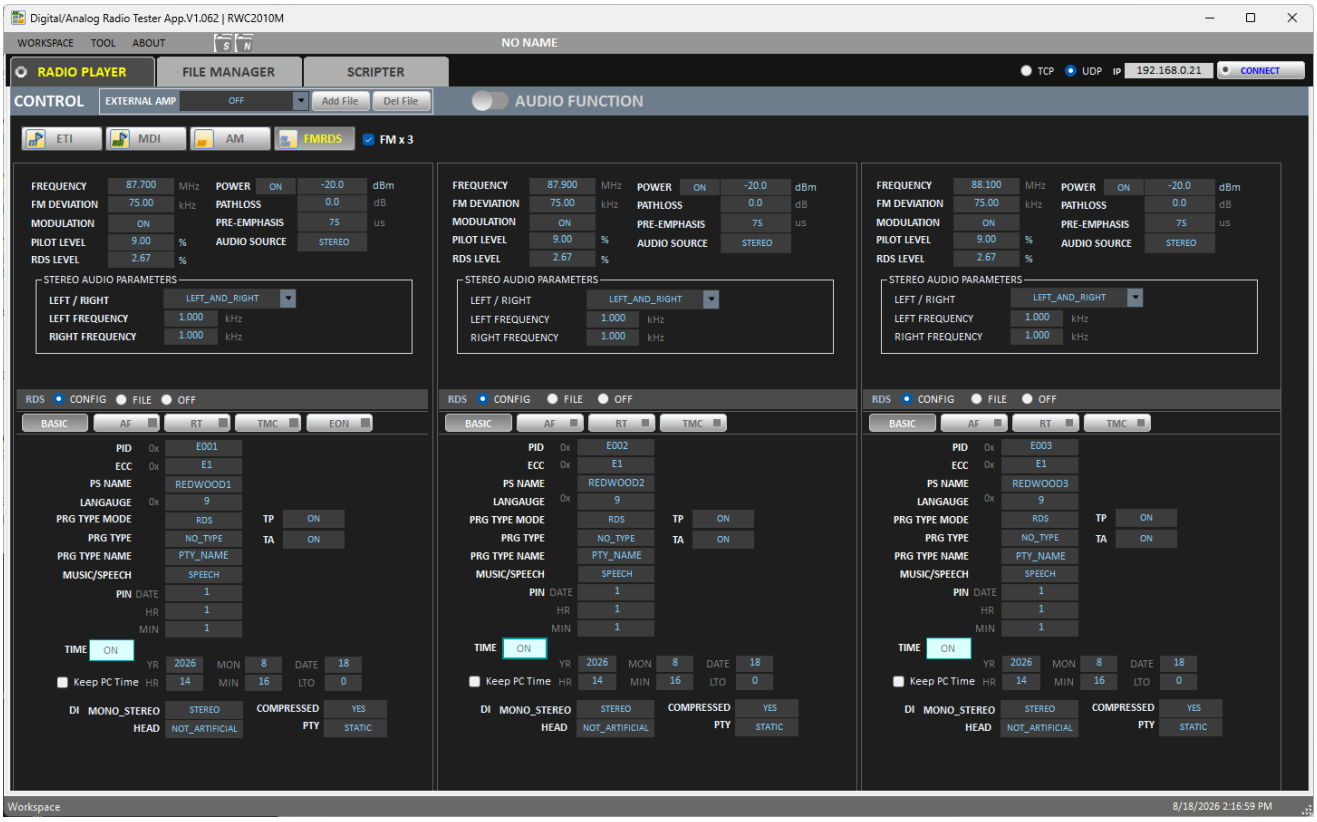


Fig. Three Channels FM Transmitter Control Panel

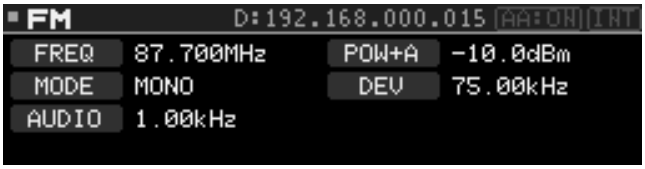


Fig. FM transmitters Information Screen

3.3.1 Parameters

FREQUENCY

FM carrier frequency in MHz

POWER

FM output power in dBm or dBuV

When operating in FM x 3 mode, the following operational constraints apply across all three channels:

Synchronized Output Power (Coupled Power Level)

All three channels share the same output power setting. Modifying the power value on any channel will automatically synchronize and update the remaining channels to the identical level.

Independent RF Output ON/OFF Control

While the power levels are linked, the RF output state ([ON/OFF]) can be controlled independently for each channel to enable or disable individual signal transmission

Common Power Unit

Different power units cannot be assigned per channel. The selected power unit (e.g., dBm or dBµV) is globally applied to all three channels simultaneously.

PATHLOSS

Synchronized Path Loss

Path loss compensation is coupled across all three channels. Changing the Pathloss value on any single channel will automatically apply the same offset to all other channels.

FM DEVIATION

FM deviation 0-75.00 kHz

PRE-EMPHASIS

Pre-emphasis value OFF/50/75 us

PILOT LEVEL

0-15.00 % (0-11.25 kHz)

RDS LEVE

0-5.00 % (0-3.75 kHz)

AUDIO SOURCE

parameter for selecting one of MONO/STEREO/WAVE/SWEEP/EXT_IN

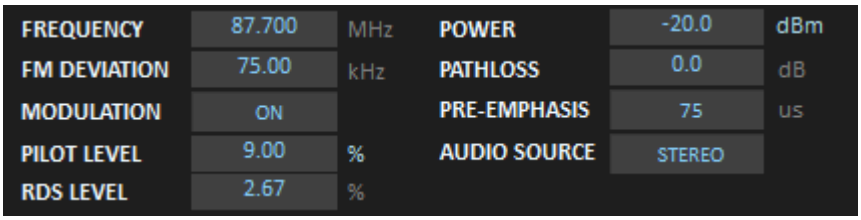


Fig. Configurable Parameters of FM Transmitter of RWC2010x PC application

3.3.2 AUDIO SOURCE

MONO

Set the MODE parameter as 'MONO' for FM Mono transmission.

FREQUENCY : Audio Frequency in kHz (0-20kHz)

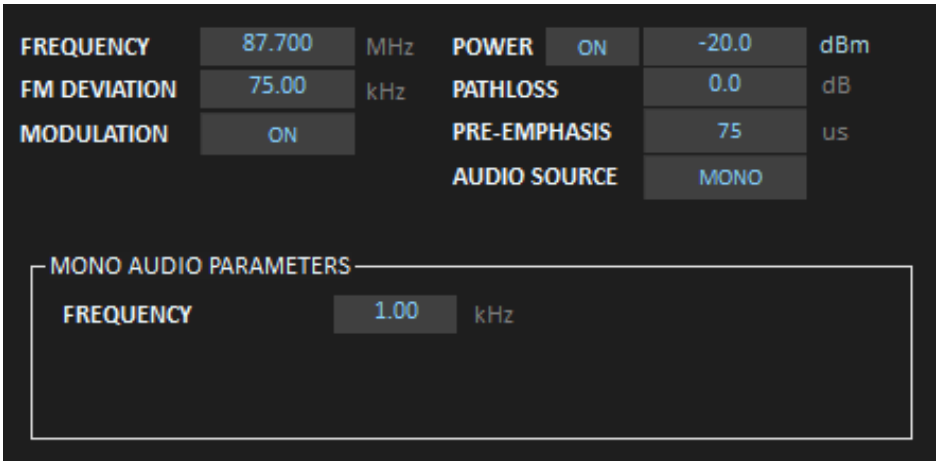


Fig. FM Transmission - Mono Mode

STEREO

Set the MODE parameter as 'STEREO' for FM Stereo transmission. In this mode, two audio signals (LEFT/RIGHT) are FM modulated. For the stereo FM test, users set left audio parameters and right audio parameters separately.

LEFT/RIGHT : LEFT_ONLY/RIGHT_ONLY/LEFT_AND_RIGHT selection
LEFT FREQUENCY : Left side audio frequency in kHz (0-20kHz)
RIGHT FREQUENCY : Right side audio frequency in kHz (0-20kHz)

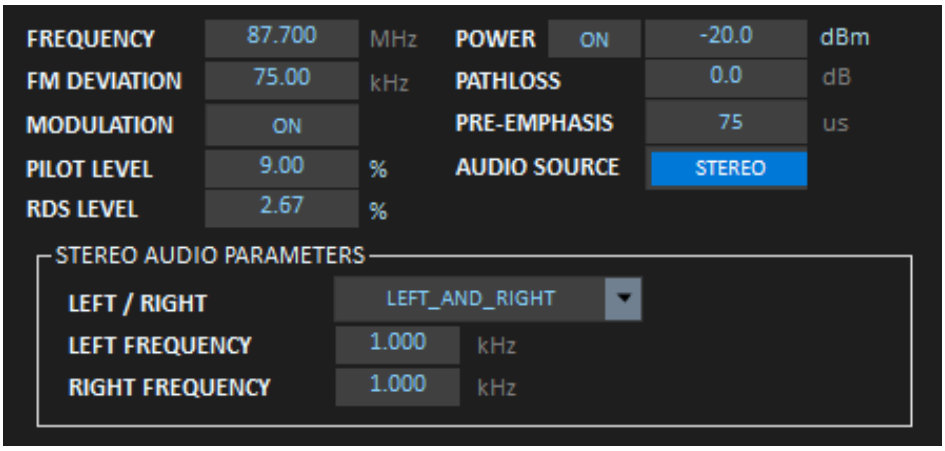


Fig. FM Transmission - Stereo Mode

WAVE

Set the MODE parameter as 'WAVE' for FM Wave file transmission. A downloaded wave file can be played with FM modulation. Users can select one of the wave files and move the current playing position with the slide control bar as the following figure.

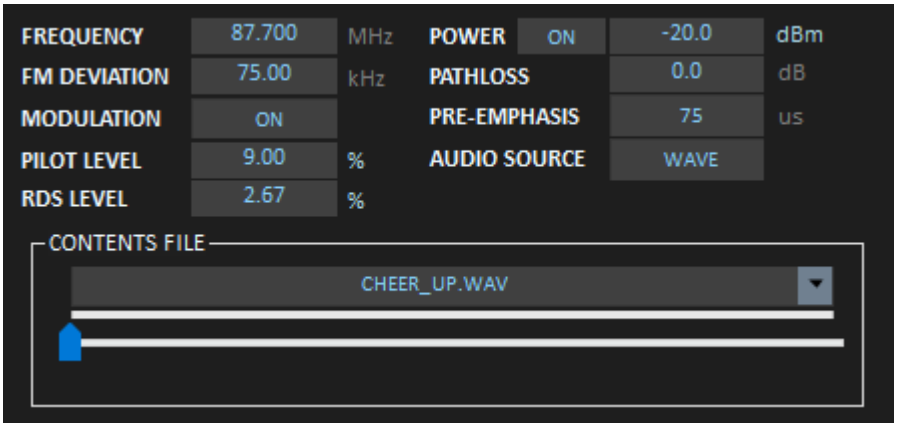


Fig. FM Transmission - Wave Mode

SWEEP

Set the MODE parameter as 'SWEEP' for FM SWEEP Mode test. In FM_SWEEP mode, RWC2010M sweeps FM audio tone frequency from the SWEEP_START to the SWEEP_STOP during SWEEP_TIME.

START FREQUENCY : Start frequency of test tone sweep in kHz (0-20kHz)
STOP FREQUENCY : Stop frequency of test tone sweep in kHz (0-20kHz)
TIME : Sweep time between start and stop frequency of test tone in ms (20-20000ms)

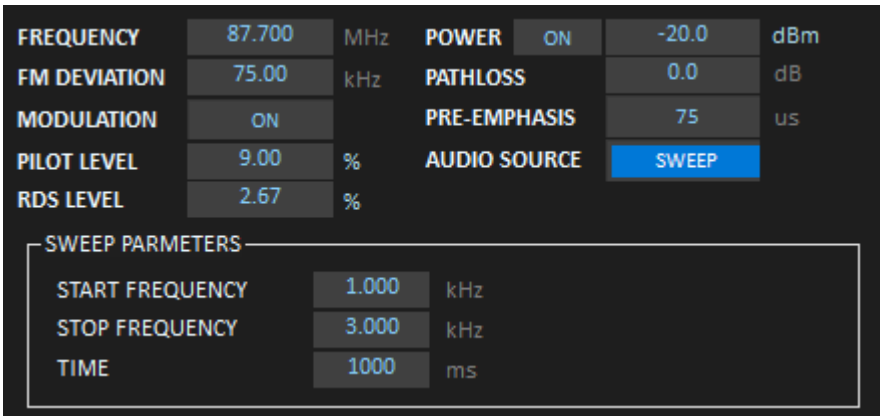


Fig. FM Transmission - Sweep Mode

EXT_IN

Set AUDIO SOURCE to EXT_IN for FM transmission that modulates the rear panel audio input signal.

GAIN: Audio gain in the range of 0 - 50dB.

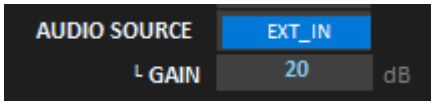


Fig. FM Transmission - External Audio Input Mode

3.3.3 RDS

RDS (Radio Data System) is a communications-protocol standard used with FM Radio broadcasting. RWC2010M provides an RDS encoding function for the FM Generator. It is available in FM-STEREO Mode.

3.3.3.1 Operation

You can select one of the configuration modes such as CONFIG, FILE, and OFF for each RDS respectively. You can configure all RDS parameters in CONFIG mode. You can also transmit an RDS recorded file by selecting the FILE option. Of course you can transmit FM broadcasting signals without RDS by selecting the OFF option.



Fig. RDS options

There are 5 categorized tabs for easy setup such as BASIC, AF, RT, TMD and EON.
Users can be recognized which test function is turned on with the on or off indication box in each parameter button.



Fig. On / off Indication box of RDS

3.3.3.2 Basic parameters

PID

This parameter is the Physical ID of the program. The Program is recognized by this value in DUTs.

ECC (Extended Count Code)

RDS uses its own country codes, composed of a combination of a Country Identifier CI and an Extended Country Code ECC.
8 bit HEX value

PS_NAME

This parameter stands for the name of Program. The maximum length of the string is 8.

LANGUAGE

To enable a broadcaster to indicate the spoken language he is currently transmitting, the 8 bit language identification codes shall be transmitted. The code 0x09 stands for English.

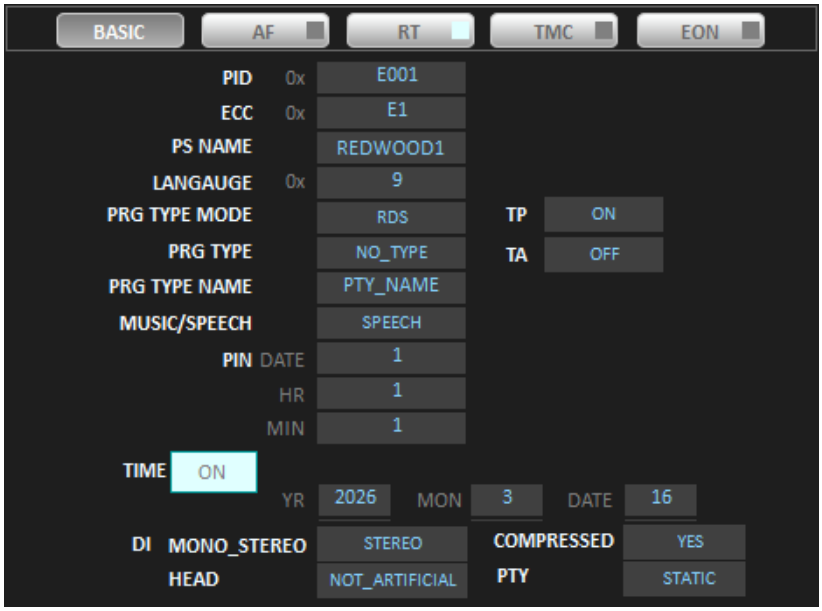


Fig. Basic parameters window of RDS

PRG_TYPE_MODE

RDS and RBDS have different tables of program type. For Europe broadcasting, please set this parameter as RDS. For American broadcasting, please set this parameter as RBDS.

PRG_TYPE

This is an identification number to be transmitted with each program item and which is intended to specify the current Program Type within 31 possibilities. This code could be used for search tuning. The code will, moreover, enable suitable receivers and recorders to be pre-set to respond only to program items of the desired type.

TP

This is a flag to indicate that the tuned program carries traffic announcements. The TP flag must only be set on programs which dynamically switch on the TA identification during traffic announcements. The signal shall be taken into account during automatic search tuning.

TA

This is an on/off switching signal to indicate when a traffic announcement is on air.

Traffic Program (TP) and Traffic Announcement (TA) Test

The setting of these two parameters stands for the following condition of the program.

TP	TA	Application
OFF	OFF	This program does not carry traffic announcements nor does it refer, via EON, to a program that does
OFF	ON	This program carries EON information about another program which gives traffic information
ON	OFF	This program carries traffic announcements but none are being broadcast at present and may also carry EON information about other traffic announcements
ON	ON	A traffic announcement is being broadcast on this program at present

MUSIC/SPEECH

Music or speech option in block 2 of Group type 0

PIN_DAY, PIN_HOUR, PIN_MINUTE

The PIN (Program Item Number) code should enable receivers and recorders designed to make use of this feature to respond to the particular program item(s) that the user has preselected. Use is made of the scheduled program time, to which is added the day of the month in order to avoid ambiguity.

DI

DI (Decoder Identification) is a 4-bit flag field that provides information about the audio characteristics of the transmitted program. It helps the receiver understand how the audio is produced and how the program type behaves.

DI information is transmitted mainly in RDS Group 0A or 0B together with the basic tuning information (PS name, AF, etc.).

MONO / STEREO

This flag indicates whether the broadcast audio is mono or stereo.

COMPRESSED / NOT COMPRESSED

This flag indicates whether dynamic range compression is applied to the audio signal.

HEAD (ARTIFICIAL / NON-ARTIFICIAL)

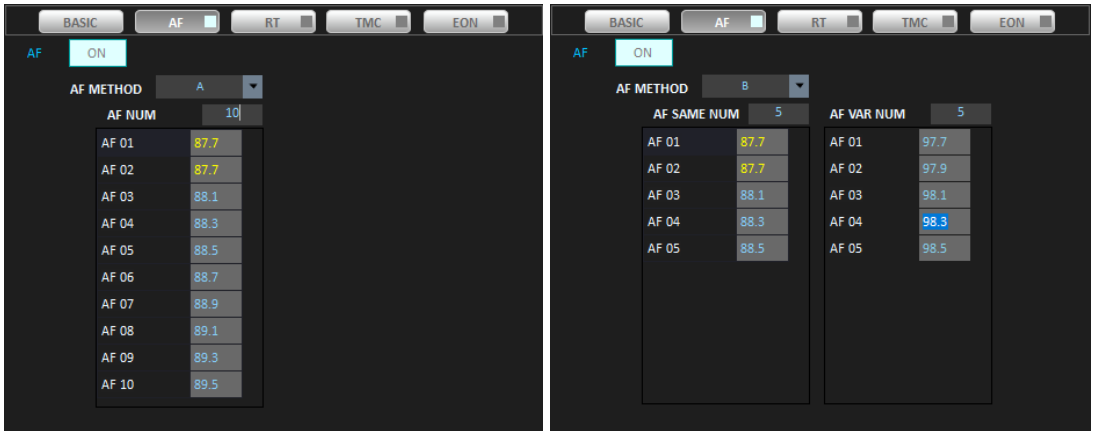
This flag indicates whether the audio content is naturally produced or artificially generated.

PTY (STATIC / DYNAMIC)

This flag indicates whether the Program Type is expected to remain constant or change frequently.

3.3.3.3 AF (Alternative Frequency)

To facilitate the automatic tuning process in a receiver, a number of AFs shall be transmitted. The AF list shall only comprise frequencies of neighboring transmitters or repeaters. RWC2010M supports two methods of transmitting AFs by setting the AF_METHOD parameter.



a. AF method A b. AF method B

Fig. AF parameters window of RDS

AF_NUM, AF_01 to AF_24

There are 2 AF methods; A and B in RDS AF mode.

Mode A The maximum number of AF of method A is 24

Mode B The maximum number of AF and AF variant of method B is 12 respectively

AF_NUM, AF_01 to AF_24 in Mode A

Alternative Frequency information informs the list of frequencies which are broadcasting the same program in the same or adjacent reception areas, and enables receivers equipped with a memory to store the list(s), to reduce the time for switching to another transmitter. This facility is particularly useful in the case of car and portable radios. Set the “AF_NUM” parameter as how many alternative frequencies you want to test.

AF_NUM, AF 01 to AF 12, and AF VAR 01 to AF VAR 12 in Mode B

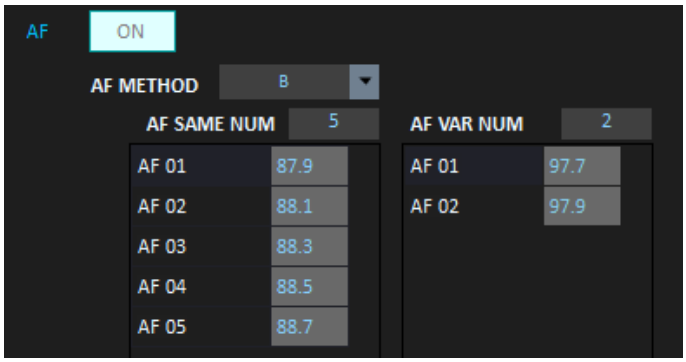


Fig. AF frequency setup of AF Method B

***Warning**

The AF that is the same to FM transmission local Frequency and the other AFs is not allowed.
If there are the same AFs to transmit local frequency or to the other AFs, the application will warn as follows.

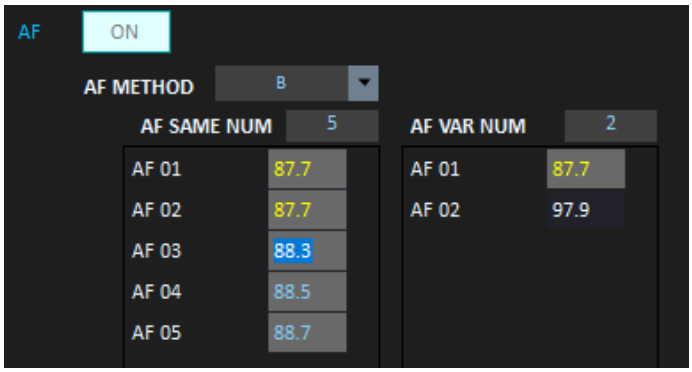


Fig. Invalid frequency of AF

3.3.3.4 RT (Radio Text)

RT stands for radio text string Service. The maximum length of the RT/RT+ TEXT string is 64 and the maximum length of eRT/eRT+ is 128 including the headline. RT editor supports all kinds of languages. And it checks the maximum available length of headline and text and shows the length violation in different colors for user convenience.



Fig. Radio text editor

RADIO_TEXT_MODE

RADIO TEXT could be turned off or turned on the RADIO TEXT as RT, RT+ which includes tag information, eRT (Enhanced Radio Text), and eRT+ which includes tag information.

RADIO_TEXT_CH

When the “RADIO_TEXT_MODE” is set as RT or RT+ this parameter will be displayed on the screen. RADIO TEXT could be broadcasted through one of 2A or 2B channels. Using this parameter, the user can select a radio text channel.

TAG_TYPE, TAG_START, TAG_LENGTH

When the “RADIO_TEXT_MODE” is set as RT+ or eRT+, these tag parameters will be displayed on the screen. Tag information can designate some sentences for special purposes such as music titles. Refer to the specification for more details.

TEXT DIR

When the “RADIO_TEXT_MODE” is set as eRT or eRT+, these parameters will be displayed in the parameter window. This flag specifies the direction of sentences with two options, LTR (Left to Right) or RTL (Right to Left)

HEADLINE

It can be set as the Headline part of the beginning of a Radio Text sentence.
Users have to check the checkbox □Headline to edit and transmit headline.

ITEM TOGGLE

The Item Toggle flag indicates that the content of the tagged item has changed. It is essentially a change

indicator for receivers.

RUNNING

The Item Running flag indicates whether the tagged item is currently active.
It tells the receiver whether the metadata refers to content that is currently being broadcast.

3.3.3.5 TMC (Traffic Message Channel)

Users can edit and set On/Off of the Traffic Message Channel. TMC is intended to be used for the coded transmission of traffic information.

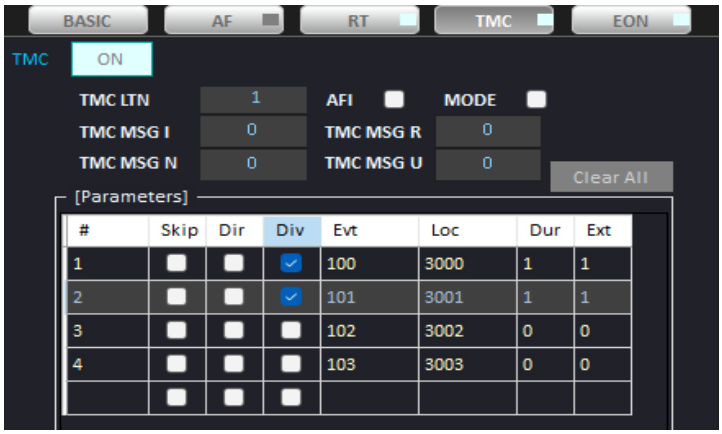


Fig. TMC parameter window

RDS will enable traffic messages to be carried digitally and silently by a Traffic Message Channel (TMC), without necessarily interrupting the audio programme. Users can transmit TMC messages by toggling the On-Off switch button as the [ON] in the RDS/TMC tab. All listed messages will be transmitted sequentially. If you select the Skip check box, all selected TMC messages will not be sent.

AFI (Alternative Frequency Indicator)

This flag indicates whether the same TMC service is available on other frequencies.

0 No alternative frequency for this TMC service
1 Alternative frequencies exist

MODE

This parameter selects the TMC service mode.

0 Standard TMC service
1 Enhanced or alternative service mode

TMC MSG R (Repetition Flag)

This flag controls message repetition behavior.

0 Normal transmission
1 Repeated message

TMC MSG N (Message Number)

This value identifies the sequence number of the TMC message.
Range: 0–15

TMC MSG U (Update Flag)

This flag indicates whether the message is a new event or an update of an existing event.

0 New traffic event

1 Update to an existing event

TMC messages can be added or deleted. Adding a TMC message is allowed only at the end line of the table. You can modify TMC messages in the workspace(.ini) file directly. RWC2010M supports three TMC messages and all names are fixed as [TMS_1], [TMS_2], [TMS_3] which are assigned to each RDS_1, 2, 3 channels respectively.

One TMC message consists of 6 messages as Duration[2:0], {Diversion:Direction:Extent[2:0]}, Event[10:0] and Location[15:0].
It will be saved with [send or skip] option at the end of the each TMC message in a workspace(.ini) file

Example of one TMC message	TMC data in the workspace.ini
7 31 100 25000 Duration = 7 Diversion = 0x01&(31>>4) = 1 Direction = 0x01&(31>>3) = 1 Extend = 0x07&(31) = 7 Event = 100 Location = 25000	[TMC_1] NUM=2 0=7 31 100 25000 1 (send) 1=3 7 101 25000 0 (skip) [TMC_2] NUM=1 0=1 1 200 25001 1 [TMC_2] NUM=1 0=1 0 300 60001 1

3.3.3.6 EON (Enhanced Other Network)

EON CH shows the other FM transmission channels of RWC2010M. The other parameters of EON are dependent on the selected EON CH. So the EON editor will read the other parameters which are related with the selected EON_CH.

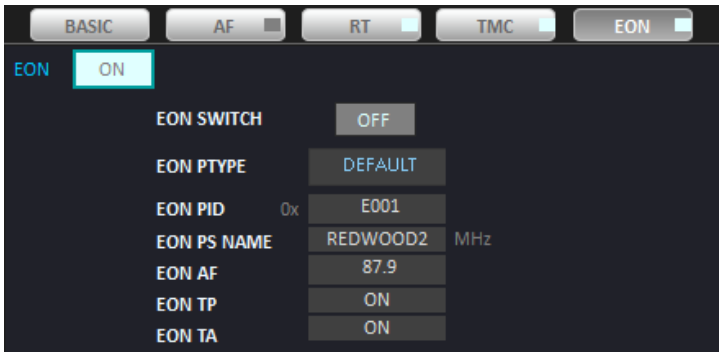


Fig. EON parameter window of RDS

The enhanced information about other networks consists of a collection of optional RDS features relating to other program services, cross-referenced by means of their PI codes. Features which may be transmitted using EON for other program services are: PID, AF, PS_NAME. RWC2010M supports multi channel FM RDS signals then EON test could be done using just one unit. To test these EON functions, just selecting the EON CH and switching on is enough.

EON

EON stands for Enhanced Other Networks information. This parameter sets On/Off of EON.

EON_CH

RWC2010M can broadcast up to 4 independent FM RDS channels. Using this parameter, other channels are selected to transmit the information of those channels.

EON_SWITCH

This parameter is for transmitting a switching signal from the turned channel to another informed channel by setting it as ON. If this parameter is set as OFF, RWC2010M transmits a stop switching signal to return to the turned channel.

EON Tab Implementation and Multi-Channel Architecture

Under the RDS standard (IEC 62106 / ETSI EN 50067), the Enhanced Other Networks (EON) architecture relies on a master-target relationship across distinct RF channels:

Host Station (FM RDS 0 — Primary Channel):

- Serves as the currently tuned network (Tuned Network / TN) by the receiver under test.
- Carries and transmits the EON cross-referencing information using RDS Group 14A (background information caching such as Target PI, PS Name, AF list, and PTY) and RDS Group 14B (real-time Traffic Announcement switching triggers).
- Because this channel acts as the originator and controller of EON data referencing other stations, the dedicated EON Tab is required solely on this channel to configure target station parameters and trigger switching events.

Target Stations (FM RDS 1 / FM RDS 2 — Auxiliary Channels):

- Function exclusively as the advertised other networks (Other Network / ON).
- These channels operate as standard, independent FM/RDS stations broadcasting their own native RDS signals (e.g., local PI, frequency, TP, and dynamic TA flags).
- Because target stations do not transmit cross-network Group 14A/14B data, an EON configuration interface is not applicable to these secondary channels.

Feature / Channel	FM RDS 0 (Host Station)	FM RDS 1 / 2 (Target Stations)
Operational Role	Tuned Network (TN)	Target Other Network (ON)
EON Data Transmission	RDS Group 14A (Continuous) / Group 14B (Trigger)	None (Standard RDS Broadcast Only)
Required Parameters	EON Switch Control Target PI, Target PS, Target AF List, Target PTY	Local Frequency, Native TP/TA State
App Configuration	**EON Provided**	Standard RDS Tabs Only

3.4 AM Generation

RWC2010M provides Analog mode for FM/AM test purposes. Analog AM mode supports MONO AM test function and wave file player function



Fig. AM Mode Selection

3.4.1 Parameters

FREQUENCY

AM carrier frequency in kHz

POWER

AM output power in dBm

AM INDEX

parameter for AUDIO VOLUME, 0-100%

MODULATION

parameter for modulation ON or OFF

PATHLOSS

Parameter for compensation the path loss between RF end point of RWC2010M and receiver (dB)

AUDIO SOURCE

Parameter for selecting one of MONO/WAVE/SWEEP/EXT_IN

3.4.2 Audio Source

MONO

In AM_MONO mode, one audio signal is AM modulated.

FREQUENCY : Audio Frequency in kHz

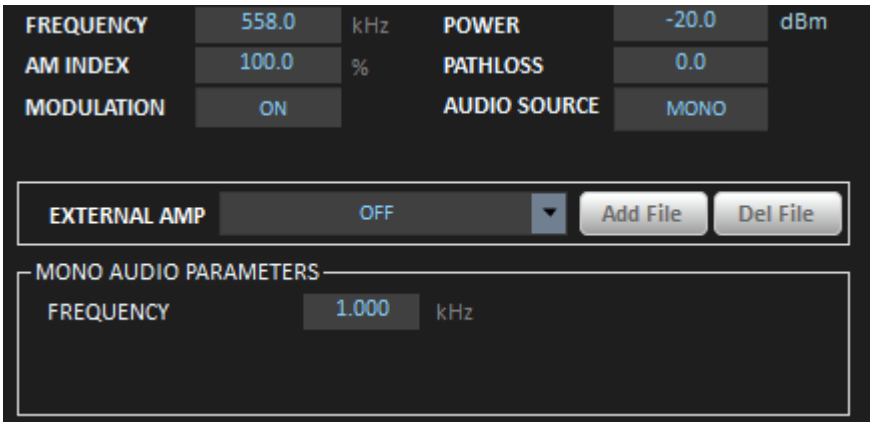


Fig. Mono AM test screen

WAVE

A stored wave file can be played with AM transmission. Users can select one of the wave files and move the current playing position with the slide control bar as the following figure.



Fig. AM File mode test screen

SWEEP

AM Set the MODE parameter as 'SWEEP' for the AM SWEEP Mode test. In AM_SWEEP mode, RWC2010M sweeps AM audio tone frequency from the SWEEP_START to the SWEEP_STOP during SWEEP_TIME.

START FREQUENCY : Start frequency of test tone sweep in kHz
STOP FREQUENCY : Stop frequency of test tone sweep in kHz
TIME : Sweep time between start and stop frequency of test tone in ms

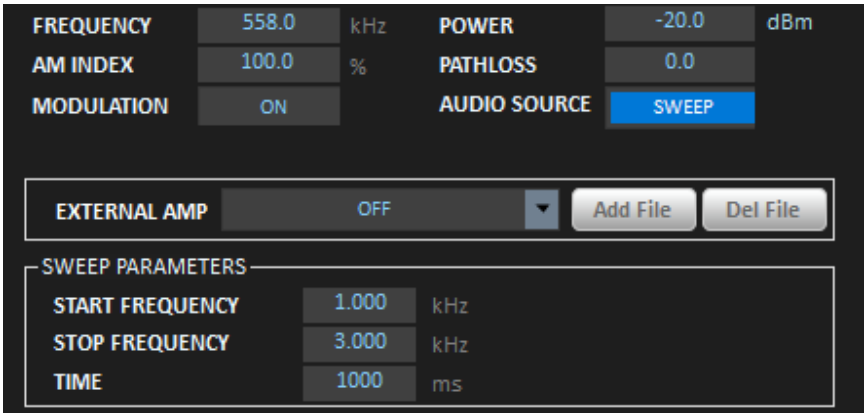


Fig. AM Sweep mode test screen

EXT_IN

Set AUDIO SOURCE to EXT_IN for AM transmission that modulates the rear panel audio input signal. In this mode, you can set the audio gain in the range of 0 - 50dB.



Fig. EXTERNAL AUDIO INPUT OPTION

4. Audio Analyzer

RWC2010M provides an audio analyzer function. With this function, you can measure frequency, SINAD, SNR, THD and THDN. You have to input the audio signal into the RCA (L+/L-/R+/R-) audio input jack on the rear panel.

4.1 Operation
4.2 Parameters
4.3 Measurement

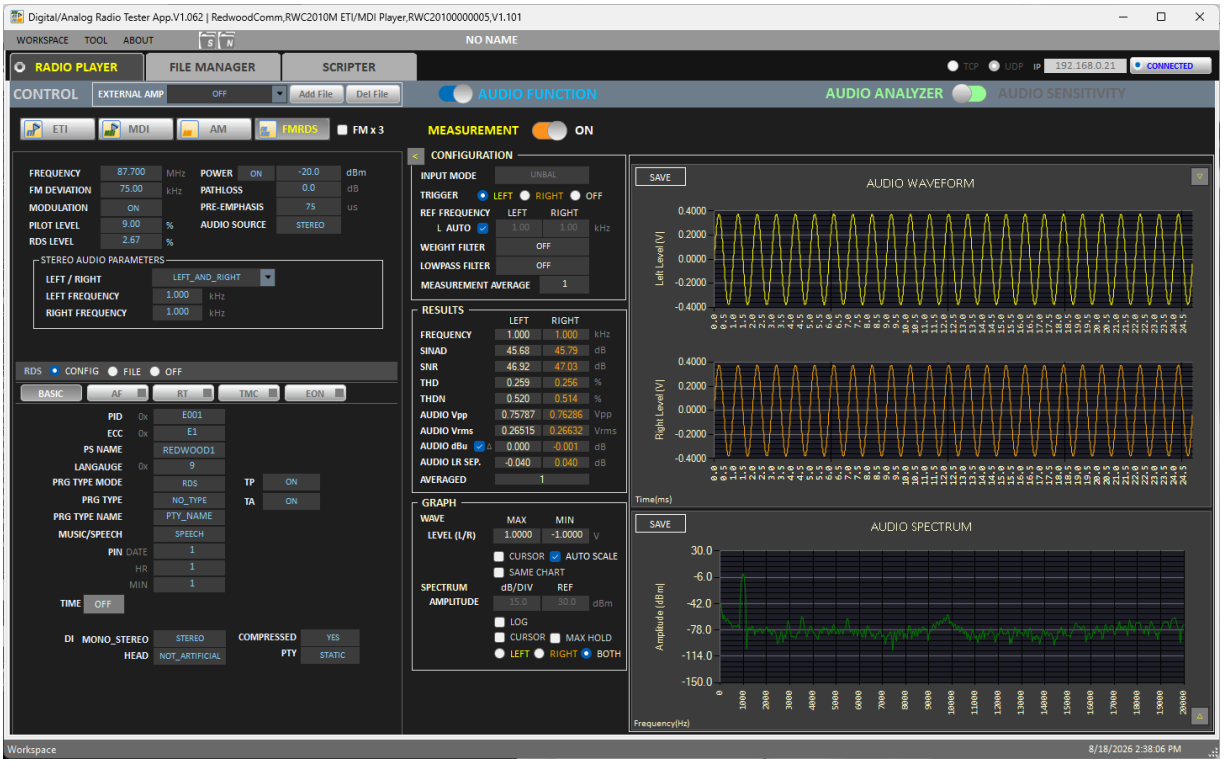


Fig. Audio analyzer function

4.1 Operation

4.1.1 Specification

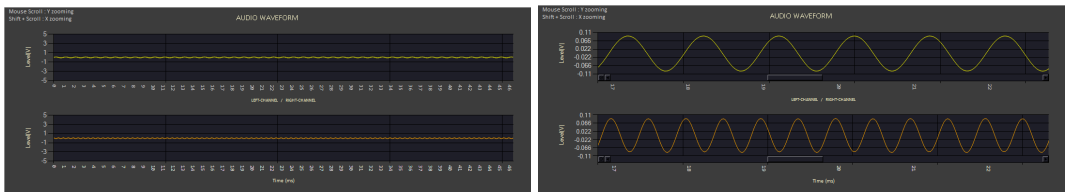
The number of point for WAVEFORM and SPECTRUM: 2048
Displaying time duration: 460 msec
Displaying bandwidth: 11.025 kHz

4.1.2 Zooming audio waveform

Using mouse scrolling up or down, you can zoom up or down the audio waveform in voltage axis direction.
If you scroll up or down with the [SHIFT] key, you can zoom up or down the audio waveform in the time axis direction.

4.1.3 Fitting audio waveform

The audio analyzer provides a zoom function using the mouse wheel.
Both x-axis and y-axis are available. With only mouse scrolling, the y-axis zoom works, and with [shift] keying and the mouse scrolling, the x-axis zoom works.
Also, by double-clicking with the left mouse button, it adjusts the signal to the y-axis in full scale automatically.

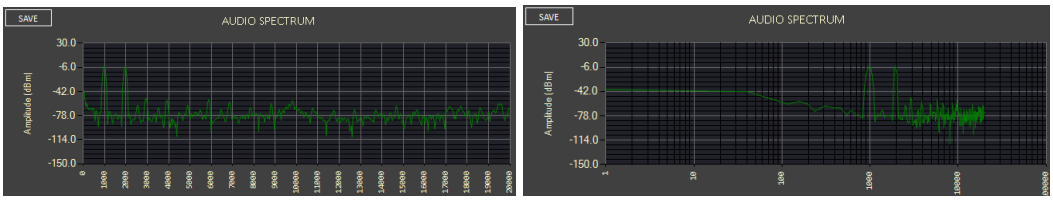


a. Before zooming b. After zooming

Fig. Zooming of the audio analyzer

4.1.4 Zooming audio spectrum

The spectrum analyzer provides a zoom function using the mouse wheel.
Only x-axis is available. With [shift] keying and the mouse scrolling, the x-axis zoom works.
Also, by double-clicking with the left mouse button, it adjusts the signal to x-axis in full scale automatically.
The double click fitting is only available for the x axis.



a. Before zooming b. After zooming

Fig. Zooming of spectrum analyzer

4.1.5 Max hold of spectrum analyzer

If you check the MAX HOLD option, it shows the maximum values of the spectrum.
If you want to reset the max value, uncheck and check the MAX HOLD check box.

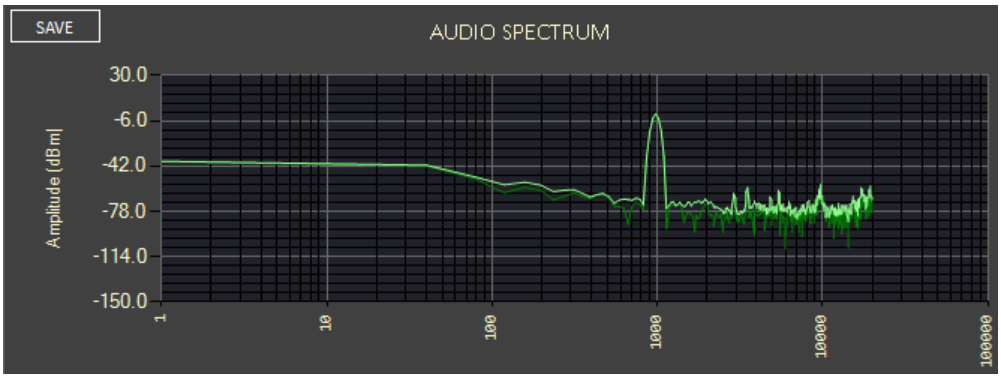


Fig. Max hold of spectrum analyzer

4.2 Parameters

4.2.1 Configuration Parameters

TRIGGER : LEFT/RIGHT/OFF
REF FREQUENCY : Reference Frequency in kHz to compare audio input signal for measurement
MEASUREMENT AVERAGE : The average number while measuring audio signal

4.2.2 Trigger

It provides three types of trigger methods such as LEFT, RIGHT, and OFF.
With an OFF trigger, the audio waveform can be swung in x-axis because RWC2010M dumps audio data without any trigger.

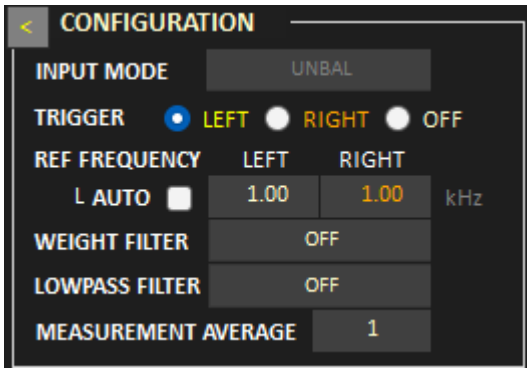


Fig. Trigger option of audio analyzer

4.2.3 Reference Frequency

For accurate measurement, users need to set up correct left and right reference frequencies expected. If the reference frequency and measuring frequency are mismatched, all measured quality values are not reliable.

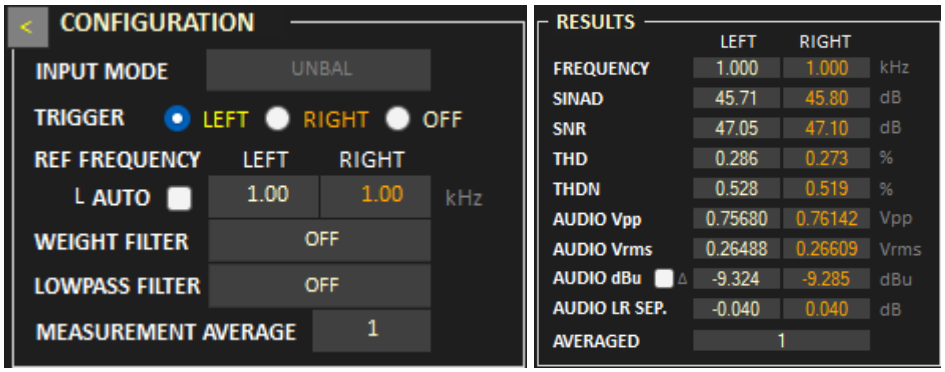


Fig. Mismatched reference example incorrect reference frequency (Bad SINAD values)
Actual received frequency = 2kHz

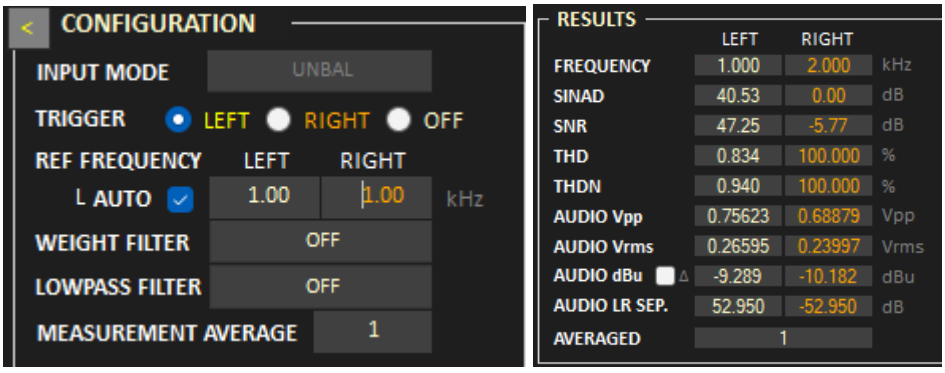


Fig. Matched reference values by auto detecting frequency (Good SINAD values)
Actual received frequency = 2kHz

4.2.4 Measurement average

It indicates how many times the RWC2010M measures the quality of the input audio signal and averages them.

4.3 Measurement

RWC2010M measures and displays values such as FREQUENCY, SINAD, SNR, THD, and THDN. All measured values will be displayed as left and right channels separately.

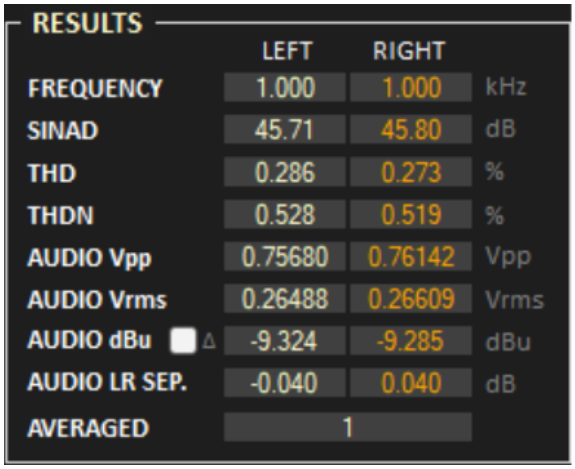


Fig. Measured quality value for audio signal

4.3.1 Frequency

A measured frequency of single tone from audio input port. The unit is Hz

4.3.2 SINAD (Signal-to-noise and distortion ratio)

It is the measured value of SINAD of tone signal from the audio input port.

The quality of a signal from a communications device, often defined as

$$SINAD = \frac{P_{sig}+P_{noise}+P_{dist}}{P_{noise}+P_{dist}},\ where$$

P_{sig}: the average power of the signal

P_{noise}: the average power of noise

P_{dist}: the average power of distortion components

Unit: dB

4.3.3 THD (Total Harmonic Distortion)

THD is defined as the ratio of the sum of the powers of all harmonic components to the power of the fundamental frequency.

$$THD_F = \frac{\sqrt{V_2^2+V_3^2+V_4^2+\dots}}{V_1}, \quad where$$

V_n: the RMS (Root Mean Squared) voltage of the n-th harmonic

n = 1: the fundamental frequency

Unit: %

4.3.4 THDN

It is THD plus noise value of sine wave at audio input port.

It is notch filtered output, and compared the ratio between the output signal with the sine wave

$$THDN = \frac{\sum_{n=2}^{\infty} harmonics+noise}{fundamental}, \quad where$$

V_n: the RMS (Root Mean Squared) voltage of the n-th harmonic

n = 1: the fundamental frequency

Unit: %

4.3.5 AUDIO Vpp

Displays the peak-to-peak voltage (Vpp) of the audio signal. This represents the difference between the maximum positive and maximum negative amplitude of the waveform.

4.3.6 AUDIO Vrms

Displays the root mean square (RMS) voltage of the audio signal. This value represents the effective power level of the audio waveform.

4.3.7 AUDIO dBu □Δ

Displays the audio level in dBu units. dBu is a voltage reference level expressed in decibels relative to 0.775 Vrms.

SNR can be determined using audio signal levels measured in dBu. With no input signal applied and the Delta checkbox unchecked, measure the baseline noise level. Next, enable the Delta checkbox to set this noise floor as the reference. When an audio signal is subsequently applied, the instrument displays the relative difference in dB, directly representing the Signal-to-Noise Ratio (SNR).

$$SNR = \frac{P_{sig}}{P_{noise}}, \quad where$$

P_{sig}: the average power of the signal

P_{noise}: the average power of noise

Unit: dB

Measuring SNR Using dBu Levels and Delta Mode

- Measure Noise Floor: With no audio signal applied, ensure the Delta checkbox is unchecked, and record the baseline noise level in dBu.
- Set Reference: Check the Delta box to lock the current noise level as the reference point ($0dB_rel$).
- Apply Signal & Read SNR: Input the test audio signal. The display will show the relative level difference in dB, which corresponds to the Signal-to-Noise Ratio (SNR) relative to the noise floor.

.

4.3.8 AUDIO LR SEP.

Displays the left-right channel separation in dB, indicating the degree of isolation between the stereo channels.

Audio Left-Right Separation (commonly referred to as Channel Separation or Stereo Separation) measures the degree of isolation between the left and right channels in a stereo audio system. It quantifies how effectively a system prevents a signal driven into one channel from leaking (crosstalking) into the opposite channel.

$$Separation(dB) = 20\log_{10}\left(\frac{V_{driven}}{V_{leakage}}\right) = Level_{driven}[dBu] - Level_{leakage}[dBu]$$

4.3.9 Averaged

It is the value showing how many times have been averaged so far while measuring the SINAD, THD, THDN and SNR.

5. Remote Control Programming

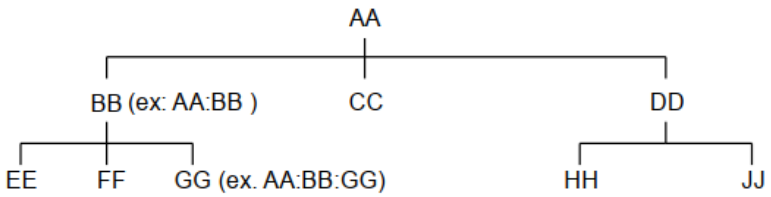
PC may control the RWC2010M remotely through Ethernet or RS232C interface using a comprehensive set of commands. This section provides the necessary information to operate the RWC2010M under Ethernet and RS232C control

5.1 Introduction
5.2 Interface for Remote Control
5.3 Command Tables

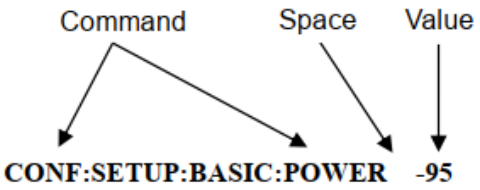
5.1 Introduction

The RWC2010M supports RS232C and Ethernet Interface, located at the rear panel for remote operation under PC control. Ethernet is used for high speed and flexible interfaces. To use Ethernet, socket programming is required. RS232C is a slow serial interface, but it does not need any special devices, and is easy to use

5.1.1 Command Structure



- Users must follow a particular path to reach lower level subcommands. For example, if you wish to access the GG command, you must follow the path AA to BB to GG (AA:BB:GG)
- Commands consist of *set commands* and *query commands* (usually simply called commands and queries). Set commands change instrument settings or perform a specific action. Queries cause the RWC2010M to return data and information about its status. Most commands have both a set form and query form. The query form of the command is started with “READ” and the set form of the command is started with “CONF”. For example, one of the set commands is **CONF:SETUP:POWER –95** and one of the query commands is **READ:SETUP:POWER?**
- When a *colon* is placed between two command mnemonics, it moves the current path down one level in the command tree
- A *space* is used to separate parameters from commands. AA:BB:FF 20
- Some commands require two parameters. Refer to the Command list.



▣ **Note**: All command s should be finished by LF (Line Feed, Char(10)) or semicolon(;).

5.1.2 Command Parameter Types

- Integer Parameter : CONF:SETUP:POWER <param> <LF>
- Double Integer parameter : CONF:SETUP:POWER <param1> <param2> <LF>
- Discrete Parameter : CONF:SETUP:BASIC:RF {ON | OFF} <LF>

5.1.3 Response to Query

- Integer: Return an integer value, e.g. 0, 100, 256, -230.
- Discrete: Return a selection.

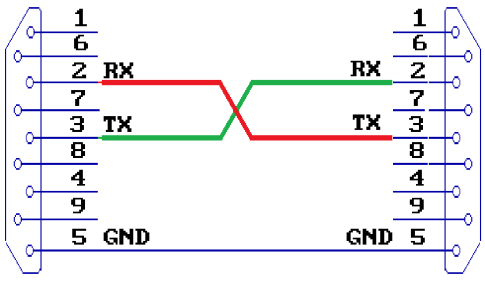
Command & Query	Response
READ:SETUP:POWER?	-10
READ:SETUP:RF?	ON

▣ **Note**: All responses are finished by LF (Line Feed, Char(10)).

5.2 Interface for Remote Control

5.2.1 RS-232C interface

Cable Connection (Cross Cable)



RWC2010M Remote PC

Control Parameters

To use RS-232C, the parameters of the Any PC software terminal program should be set up as follows.

Parameter	Range	Description
BAUD RATE	115200 bps	data speed
DATA BITS	8-bit	Length of Data bit
PARITY	Off	Error check bit
STOP BIT	1-bit	Stop bit
CONTROL BIT	NONE	

5.2.2 Ethernet Interface

Connect LAN port of PC and RWC2010M Ethernet port by RJ45 cable. You can see the IP address of RWC2010M at the upper right side of the screen. The ethernet protocol is UDP and the port number is 5001.

If the PC and RWC2010M are connected directly, Cross cable must be used. And set up the IP address as follows.

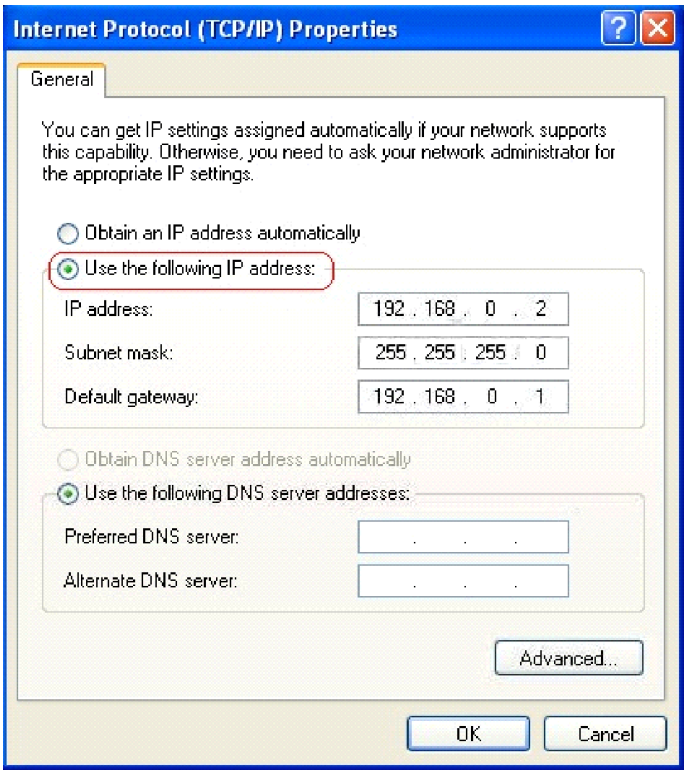


Fig. How to set up the static IP address of PC with Window OS

5.2.3 Remote Programming guide

- Set Serial Port
- Set up Baud Rate, Parity Bit (None), Data Bit (8 bit), Stop Bit (1 bit).
- Open port.
- Send RS232C command through serial port.
- Check command execution results on the RWC2010M screen.

- Send the next command after successful execution of the previous command.
- If it is difficult to check the execution of the previous command, the next command should be sent after a few milliseconds.

- A colon is used between commands.
- A space is only used between parameter values and commands.
- All commands should be finished by LF (Line Feed, char(10)).

5.3 Command Tables

5.3.1 Common Commands

COMMAND	<param1> RANGE	DESCRIPTION
*IDN?		Query Identification
*RST		Full preset command
*SAVE	SAVE_00 - SAVE_09	Save current parameters setting to memory. The SAVE NAME can be modified using the CONF:SETUP:SAVE_NAME command
*RECALL	SAVE_00 - SAVE_09	Recall saved parameters setting from memory
EXEC:REBOOT		Reboot Tester
READ:SETUP:RF?		Query current RF output status (ON or OFF)
CONF:SETUP:RF <param1>	OFF, ON	RF ON or OFF
READ:SETUP:MODULATION?		Query current modulation status (ON or OFF)
CONF:SETUP:MODULATION <param1>	OFF, ON	Modulation On/Off
READ:SETUP:FREQUENCY?		Query current RF carrier frequency
CONF:SETUP:FREQUENCY <param1>	0.15 ~ 30 MHz 47 ~ 68 MHz 87 ~ 108 MHz 174 ~ 250 MHz	LF/MF/HF Band Band I Band II Band III
READ:SETUP:POWER?		Read Power(dBm)
CONF:SETUP:POWER <param1>	[CONF:SETUP:TESTER_MODE] For AM, -110.0 ~ -10.0; For FM, -110.0 ~ 0.0; For ETI, -120.0 ~ -10.0; For MDI, -120.0 ~ -20.0	Set Power(dBm)
READ:SETUP:POWER:DBUV?		Read Power(dBuV)
CONF:SETUP:POWER:DBUV <param1>	[CONF:SETUP:TESTER_MODE] For AM, -3.0 ~ 97.0; For FM, -3.0 ~ 107.0; For ETI, -13.0 ~ 97.0; For MDI, -13.0 ~ 87.0	Set Power(dBuV)
READ:SETUP:PATH_LOSS?		Query the current setup RF path-loss value
CONF:SETUP:PATH_LOSS <param1>	-60.0 ~ 60.0	Setup the the RF path-loss value (dB)
READ:SETUP:TESTER_MODE?		Query current operating mode of the tester
CONF:SETUP:TESTER_MODE <param1>	FM, AM, ETI, MDI, DRM_IQ	Set operating mode of the tester.

COMMAND	<param1> RANGE	<param2> RANGE	DESCRIPTION
READ:SETUP:SAVE_NAME? <param1>	0 - 9		Query the custom name of the specified memory save slot (0-9)

COMMAND	<param1> RANGE	<param2> RANGE	DESCRIPTION
CONF:SETUP:SAVE_NAME <param1> <param2>	0 - 9	NAME	Edit the SAVE name, with a max 16 characters

5.3.2 ETI/MDI Commands

COMMAND	<param1> RANGE	DESCRIPTION
READ:ETI:CONFIG:MODE?		Query current playback mode (ETI, MDI, or DRM_IQ).
CONF:ETI:CONFIG:MODE <param1>	ETI, MDI, DRM_IQ	Set playback mode.
READ:ETI:CONFIG:CONTENTS?		Query the filename of the currently selected ETI/MDI content file
CONF:ETI:CONFIG:CONTENTS <param1>	File name	Select ETI/MDI content file for playback
EXEC:ETI:CONFIG:CONTENTS_RST <param1>	0.0 ~ 99.9	Reset content file playback position to the specified percentage
READ:ETI:CONFIG:TII?		Query current Transmitter Identification Information (TII) status (ON or OFF)
CONF:ETI:CONFIG:TII <param1>	OFF, ON	Set TII transmission status
READ:ETI:CONFIG:TII_SUB_ID?		Query current TII Sub-identifier value.
CONF:ETI:CONFIG:TII_SUB_ID <param1>	0 ~ 23	Set TII Sub-identifier value
READ:ETI:CONFIG:TII_MAIN_ID?		Query current TII Main-identifier value
CONF:ETI:CONFIG:TII_MAIN_ID <param1>	0 ~ 69	Set TII Main-identifier value
READ:ETI:CONFIG:AF_CRC_CHECK?		Query current Alternative Frequency (AF) CRC checking status
CONF:ETI:CONFIG:AF_CRC_CHECK <param1>	OFF, ON	Enable or disable AF CRC checking status
READ:ETI:CONFIG:SAMPLING_FREQ?		Query current I/Q sampling frequency.
CONF:ETI:CONFIG:SAMPLING_FREQ <param1>	48, 192, 250	Set I/Q sampling frequency (kHz)
READ:ETI:CONFIG:IQ_SWAP?		Query current I/Q phase swap status (ON or OFF)
CONF:ETI:CONFIG:IQ_SWAP <param1>	OFF, ON	Enable or disable I/Q phase swap
READ:ETI:CONFIG:IQ_POLARITY?		Query current I/Q signal polarity status
CONF:ETI:CONFIG:IQ_POLARITY <param1>	POSITIVE, NEGATIVE	Set I/Q signal polarity

5.3.3 Analog FM Commands

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:FM:CHANNEL? <param1>	0-2		Query FM channel transmission status (ON or OFF)
CONF:ANALOG:FM:CHANNEL <param1> <param2>	0-2	OFF, ON	Enable or disable FM channel transmission

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:FM:FREQUENCY? <param1>	0-2		Query current FM carrier frequency
CONF:ANALOG:FM:FREQUENCY <param1>	0-2	47 ~ 68 76 ~ 108	Set FM carrier frequency (MHz) The maximum frequency separation between FM channels is 3 MHz.
READ:ANALOG:FM:FM_MODE? <param1>	0-2		Query current FM audio source mode
CONF:ANALOG:FM:FM_MODE <param1> <param2>	0-2	MONO, STEREO, WAVE, SWEEP, EXT_IN	Set FM audio source mode
READ:ANALOG:FM:AUDIO_FREQ? <param1>	0-2		Query mono audio frequency
CONF:ANALOG:FM:AUDIO_FREQ <param1> <param2>	0-2	0 ~ 20	Set mono audio frequency (kHz)
READ:ANALOG:FM:STEREO_MODE? <param1>	0-2		Query current stereo channel configuration
CONF:ANALOG:FM:STEREO_MODE <param1> <param2>	0-2	LEFT_AND_RIGHT, LEFT_ONLY, RIGHT_ONLY	Set stereo channel configuration
READ:ANALOG:FM:AUDIO_FREQ_R? <param1>	0-2		Query Right channel audio frequency
CONF:ANALOG:FM:AUDIO_FREQ_R <param1> <param2>	0-2	0 ~ 20	Set Right channel audio frequency (kHz)
READ:ANALOG:FM:AUDIO_FREQ_L? <param1>	0-2		Query Left channel audio frequency
CONF:ANALOG:FM:AUDIO_FREQ_L <param1> <param2>	0-2	0 ~ 20	Set Left channel audio frequency (kHz)
READ:ANALOG:FM:CONTENTS? <param1>	0-2		Query the filename of the currently selected audio WAVE file
CONF:ANALOG:FM:CONTENTS <param1> <param2>	0-2	File name	Select audio WAVE file for transmission
EXEC:ANALOG:FM:CONTENTS_RST <param1>	0-2	0.0 ~ 99.9	Reset WAVE file playback position to the specified percentage
READ:ANALOG:FM:WAVE_FS? <param1>	0-2		Query sampling rate (Fs) of the current WAVE file
READ:ANALOG:FM:WAVE_CH? <param1>	0-2		Query number of channels of the current WAVE file
READ:ANALOG:FM:WAVE_BITS? <param1>	0-2		Query bit depth (resolution) of the current WAVE file
READ:ANALOG:FM:SWEEP_START? <param1>	0-2		Query start frequency for audio sweep
CONF:ANALOG:FM:SWEEP_START <param1> <param2>	0-2	0 ~ 15	Set start frequency for audio sweep (kHz)
READ:ANALOG:FM:SWEEP_STOP? <param1>	0-2		Query stop frequency for audio sweep
CONF:ANALOG:FM:SWEEP_STOP <param1> <param2>	0-2	0 ~ 15	Set stop frequency for audio sweep (kHz)
READ:ANALOG:FM:SWEEP_TIME? <param1>	0-2		Query duration of the audio sweep
CONF:ANALOG:FM:SWEEP_TIME <param1> <param2>	0-2	20 ~ 10000	Set duration of the audio sweep (ms)
READ:ANALOG:FM:AUDIO_IN_GAIN? <param1>	0-2		Query gain value applied to the external audio input
CONF:ANALOG:FM:AUDIO_IN_GAIN <param1> <param2>	0-2	0 ~ 50	Set gain value for the external audio input (dB)
READ:ANALOG:FM:AUDIO_IN_LEVEL? <param1>	0-2		Query actual measured level of the external audio input.

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:FM:FM_DEVIATION? <param1>	0-2		Query current FM peak frequency deviation
CONF:ANALOG:FM:FM_DEVIATION <param1> <param2>	0-2	0 ~ 75	Set FM peak frequency deviation (kHz)
READ:ANALOG:FM:PRE_EMPHASIS? <param1>	0-2		Query current pre-emphasis filter status (ON or OFF)
CONF:ANALOG:FM:PRE_EMPHASIS <param1> <param2>	0-2	OFF, ON	Enable or disable pre-emphasis filter
READ:ANALOG:FM:TIME_CONSTANT? <param1>	0-2		Query current pre-emphasis time constant
CONF:ANALOG:FM:TIME_CONSTANT <param1> <param2>	0-2	25, 50, 75	Set pre-emphasis time constant (us)
READ:ANALOG:FM:PILOT_LEVEL? <param1>	0-2		Query current Stereo Pilot carrier level status
CONF:ANALOG:FM:PILOT_LEVEL <param1> <param2>	0-2	0 ~ 15	Set Stereo Pilot carrier level value
READ:ANALOG:FM:PILOT_LEVEL_PERCENT? <param1>	0-2		Query Stereo Pilot carrier injection level in percentage
CONF:ANALOG:FM:PILOT_LEVEL_PERCENT <param1> <param2>	0-2	0 ~ 15	Set Stereo Pilot carrier injection level in percentage (%)
READ:ANALOG:FM:PILOT_LEVEL_KHZ? <param1>	0-2		Query Stereo Pilot carrier deviation level in kHz
CONF:ANALOG:FM:PILOT_LEVEL_KHZ <param1> <param2>	0-2	0 ~ 11.3	Set Stereo Pilot carrier deviation level in kHz
READ:ANALOG:FM:RDS_LEVEL_PERCENT? <param1>	0-2		Query RDS subcarrier injection level in percentage
CONF:ANALOG:FM:RDS_LEVEL_PERCENT <param1> <param2>	0-2	0.0 ~ 5.0	Set RDS subcarrier injection level in percentage (%)
READ:ANALOG:FM:RDS_LEVEL_KHZ? <param1>	0-2		Query RDS subcarrier deviation level in kHz
CONF:ANALOG:FM:RDS_LEVEL_KHZ <param1> <param2>	0-2	0.00 ~ 3.75	Set RDS subcarrier deviation level in kHz
READ:ANALOG:FM:RDS_PHASE? <param1>	0-2		Query phase angle of the RDS subcarrier relative to pilot
CONF:ANALOG:FM:RDS_PHASE <param1> <param2>	0-2	0 ~ 359	Set phase angle of the RDS subcarrier relative to pilot (degrees)

5.3.4 Analog RDS Commands

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:RDS_MODE? <param1>	0-2		Query current RDS generator status (ON or OFF).
CONF:ANALOG:RDS:RDS_MODE <param1> <param2>	0-2	OFF, ON	Enable or disable RDS generator
READ:ANALOG:RDS:PID? <param1>	0-2		Query Program Identification (PI) code
CONF:ANALOG:RDS:PID <param1> <param2>	0-2	0x0001 ~ 0xFFFF	Set Program Identification (PI) code
READ:ANALOG:RDS:REF? <param1>	0-2		Query internal reference tracking parameters
CONF:ANALOG:RDS:REF <param1> <param2>	0-2	1 ~ 255	Set internal reference tracking parameters
READ:ANALOG:RDS:COUNTRY? <param1>	0-2		Query Country Identifier (CI) code

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
CONF:ANALOG:RDS:COUNTRY <param1> <param2>	0-2	1 ~ 15	Set Country Identifier (CI) code
READ:ANALOG:RDS:AREA_CODE? <param1>	0-2		Query current program coverage Area Code
CONF:ANALOG:RDS:AREA_CODE <param1> <param2>	0-2	LOCAL, INTERNATIONAL, NATIONAL, SUPRA-REGIONAL, REGIONAL_01 ~ REGIONAL_12	Set program coverage Area Code classification
READ:ANALOG:RDS:ECC? <param1>	0-2		Query Extended Country Code (ECC)
CONF:ANALOG:RDS:ECC <param1> <param2>	0-2	0x00 ~ 0xFF	Set Extended Country Code (ECC)
READ:ANALOG:RDS:MUSIC_SPEECH? <param1>	0-2		Query current Music/Speech flag status
CONF:ANALOG:RDS:MUSIC_SPEECH <param1> <param2>	0-2	MUSIC, SPEECH	Query current Music/Speech flag status
READ:ANALOG:RDS:PS_NAME? <param1>	0-2		Set Music/Speech audio source classification flag
CONF:ANALOG:RDS:PS_NAME <param1> <param2>	0-2	Max 8-byte Characters	Set Program Service (PS) Name string
READ:ANALOG:RDS:PS_NAME_HEX? <param1>	0-2		Query PS Name formatted in raw hexadecimal values
CONF:ANALOG:RDS:PS_NAME_HEX <param1> <param2>	0-2	Max 8-byte Hexadecimal Values	Set PS Name formatted in raw hexadecimal values
READ:ANALOG:RDS:LANGUAGE? <param1>	0-2		Query current Language Identification code
CONF:ANALOG:RDS:LANGUAGE <param1> <param2>	0-2	0x00 ~ 0xFF	Set Language Identification code
READ:ANALOG:RDS:TMC? <param1>	0-2		Query current TMC service status (ON or OFF)
CONF:ANALOG:RDS:TMC <param1> <param2>	0-2	OFF, ON	Enable or disable Traffic Message Channel (TMC) service
READ:ANALOG:RDS:TMC_LTN? <param1>	0-2		Query current TMC Location Network (LTN) value
CONF:ANALOG:RDS:TMC_LTN <param1> <param2>	0-2	0 ~ 63	Set TMC Location Network (LTN) value
READ:ANALOG:RDS:TMC_MGS_AFI? <param1>	0-2		Query Alternative Frequency Indicator (AFI) for TMC
CONF:ANALOG:RDS:TMC_MGS_AFI <param1> <param2>	0-2	0, 1	Set Alternative Frequency Indicator (AFI) for TMC
READ:ANALOG:RDS:TMC_MGS_MODE? <param1>	0-2		Query TMC system operational Service Mode
CONF:ANALOG:RDS:TMC_MGS_MODE <param1> <param2>	0-2	0, 1	Set TMC system operational Service Mode
READ:ANALOG:RDS:TMC_MGS_I? <param1>	0-2		Query TMC Message Identification (I) continuity flag.
CONF:ANALOG:RDS:TMC_MGS_I <param1> <param2>	0-2	0, 1	Set TMC Message Identification (I) continuity flag
READ:ANALOG:RDS:TMC_MGS_N? <param1>	0-2		Query TMC Message sequence Multi-packet grouping identifier
CONF:ANALOG:RDS:TMC_MGS_N <param1> <param2>	0-2	0, 1	Set TMC Message sequence Multi-packet grouping identifier
READ:ANALOG:RDS:TMC_MGS_R? <param1>	0-2		Query TMC Repetition (R) status transmission flag

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
CONF:ANALOG:RDS:TMC_MGS_R <param1> <param2>	0-2	0, 1	Set TMC Repetition (R) status transmission flag
READ:ANALOG:RDS:TMC_MGS_U? <param1>	0-2		Query TMC Event Update (U) or clear status flag
CONF:ANALOG:RDS:TMC_MGS_U <param1> <param2>	0-2	0, 1	Set TMC Event Update (U) or clear status flag

COMMAND	<param1> Channel #	<param2> RANGE	<param3> RANGE	DESCRIPTION
READ:ANALOG:RDS:TMC_GROUP? <param1> <param2>	0-2	[tmc group number] 0 ~ 4		Query the enable status of the specified TMC group index
CONF:ANALOG:RDS:TMC_GROUP <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4	OFF, ON	Enable or disable the specified TMC group index
READ:ANALOG:RDS:TMC_DIVERSION? <param1> <param2>	0-2	[tmc group number] 0 ~ 4		Query current Diversion parameter for the specified TMC group
CONF:ANALOG:RDS:TMC_DIVERSION <param1> <param2> <param2>	0-2	[tmc group number] 0 ~ 4	0, 1	Set Diversion parameter for the specified TMC group
READ:ANALOG:RDS:TMC_DIRECTION? <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4		Query current Direction parameter for the specified TMC group
CONF:ANALOG:RDS:TMC_DIRECTION <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4	0, 1	Set Direction parameter for the specified TMC group
READ:ANALOG:RDS:TMC_LOCATION? <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4		Query Location Code parameter for the specified TMC group
CONF:ANALOG:RDS:TMC_LOCATION <param1> <param2> <param2>	0-2	[tmc group number] 0 ~ 4	0 ~ 65535	Set Location Code parameter for the specified TMC group
READ:ANALOG:RDS:TMC_EVENT? <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4		Query Event Code parameter for the specified TMC group
CONF:ANALOG:RDS:TMC_EVENT <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4	0 ~ 2047	Set Event Code parameter for the specified TMC group
READ:ANALOG:RDS:TMC_EXTENT? <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4		Query Extent parameter string for the specified TMC group
CONF:ANALOG:RDS:TMC_EXTENT <param1> <param2> <param3>	0-2	[tmc group number] 0 ~ 4	0 ~ 7	Set Extent parameter string for the specified TMC group

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:TP? <param1>			Query main Program Traffic Program (TP) flag

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
CONF:ANALOG:RDS:TP <param1> <param2>	0-2	OFF, ON	Set main Program Traffic Program (TP) flag
READ:ANALOG:RDS:TA? <param1>	0-2		Query main Program Traffic Announcement (TA) switching flag
CONF:ANALOG:RDS:TA <param1> <param2>	0-2	OFF, ON	Set main Program Traffic Announcement (TA) switching flag
READ:ANALOG:RDS:EON?> <param1>	0		Query Enhanced Other Networks (EON) option status
CONF:ANALOG:RDS:EON <param1> <param2>	0	OFF, ON	Enable or disable EON
READ:ANALOG:RDS:EON_PID? <param1>	0		Query bound PI code of the cross-referenced EON network
READ:ANALOG:RDS:EON_PS_NAME? <param1>	0		Query hex representation of cross-referenced EON PS Name
READ:ANALOG:RDS:EON_PS_NAME_HEX? <param1>	0		Query hex representation of cross-referenced EON PS Name
READ:ANALOG:RDS:EON_AF? <param1>	0		Query Alternative Frequencies list of the referenced EON network
READ:ANALOG:RDS:EON_TP? <param1>	0		Query Traffic Program (TP) flag of the referenced EON network
READ:ANALOG:RDS:EON_TA? <param1>	0		Query Traffic Announcement (TA) status of the referenced EON network
READ:ANALOG:RDS:EON_SWITCH? <param1>	0		Query Type 14B group cross-network active switching trigger status
CONF:ANALOG:RDS:EON_SWITCH <param1> <param2>	0	OFF, ON	Trigger Type 14B group cross-network active target switching sequence
READ:ANALOG:RDS:EON_PTY? <param1>	0		Query Program Type (PTY) definition code of the EON network
CONF:ANALOG:RDS:EON_PTY <param1> <param2>	0	NEWS, WEATHER, ALARM	Set Program Type (PTY) definition code of the EON network
READ:ANALOG:RDS:RADIO_TEXT_MODE? <param1>	0-2		Query configuration profile mode for Radio Text (RT/RT+/eRT)
CONF:ANALOG:RDS:RADIO_TEXT_MODE <param1> <param2>	0-2	OFF, RT, RT+, eRT, eRT+	Set configuration profile mode for Radio Text
READ:ANALOG:RDS:HEADLINE_MODE? <param1>	0-2		Query Enhanced Radio Text (eRT) Headline display block toggle status
CONF:ANALOG:RDS:HEADLINE_MODE <param1> <param2>	0-2	OFF, ON	Enable or disable eRT Headline block transmission
READ:ANALOG:RDS:RADIO_TEXT_HEADLINE? <param1>	0-2		Query ASCII string content defined for eRT Headline
CONF:ANALOG:RDS:RADIO_TEXT_HEADLINE <param1> <param2>	0-2	Max 32-byte Characters	Set ASCII string content for eRT Headline
READ:ANALOG:RDS:RADIO_TEXT_HEADLINE_HEX? <param1>	0-2		Query hex values payload of eRT Headline
CONF:ANALOG:RDS:RADIO_TEXT_HEADLINE_HEX <param1> <param2>	0-2	Max 32-byte Hexadecimal Values	Set raw hex values payload for eRT Headline

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:RADIO_TEXT? <param1>	0-2		Query body character string defined for standard Radio Text payload
CONF:ANALOG:RDS:RADIO_TEXT <param1> <param2>	0-2	Max 32-byte Characters	Set body character string defined for standard Radio Text payload
READ:ANALOG:RDS:RADIO_TEXT_HEX? <param1>	0-2		Query hex representation array of current standard Radio Text payload
CONF:ANALOG:RDS:RADIO_TEXT_HEX <param1> <param2>	0-2	Max 32-byte Hexadecimal Values	Set hex representation array for standard Radio Text payload
READ:ANALOG:RDS:RADIO_TEXT_CH? <param1>	0-2		Query allocated RDS group transmission architecture channel (2A or 2B)
CONF:ANALOG:RDS:RADIO_TEXT_CH <param1> <param2>	0-2	2A, 2B	Set allocated RDS group transmission architecture channel (2A or 2B)
READ:ANALOG:RDS:TAG0_TYPE? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG0_START)
CONF:ANALOG:RDS:TAG0_TYPE <param1> <param2>	0-2	DUMMY, ITEM_TITLE, ITEM_ALBUM, ITEM_TRACKNUMBER, ITEM_ARTIST, ITEM_COMPOSITION, ITEM_MOVEMENT, ITEM_CONDUCTOR, ITEM_COMPOSER, ITEM_BAND, ITEM_COMMENT, ITEM_GENRE, INFO_NEWS, INFO_NEWS_LOCAL, INFO_STOCKMARKET, INFO_SPORT, INFO_LOTTERY, INFO_HOROSCOPE, INFO_DAILY_DIVERSION, INFO_HEALTH, INFO_EVENT, INFO_SCENE, INFO_CINEMA, INFO_TV, INFO_DATE_TIME, INFO_WEATHER, INFO_TRAFFIC, INFO_ALARM, INFO_ADVERTISEMENT, INFO_URL, INFO_OTHER, STATIONNAME_SHORT, STATIONNAME_LONG, PROGRAMME_NOW, PROGRAMME_NEXT, PROGRAMME_PART, PROGRAMME_HOST, PROGRAMME_EDITORIAL_STAFF, PROGRAMME_FREQUENCY, PROGRAMME_HOMEPAGE, PROGRAMME_SUBCHANNEL, PHONE_HOTLINE, PHONE_STUDIO, PHONE_OTHER, SMS_STUDIO, SMS_OTHER, EMAIL_HOTLINE, EMAIL_STUDIO, EMAIL_OTHER, MMS_OTHER, CHAT, CHAT_CENTER, VOTE_QUESTION, VOTE_CENTRE,	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG0_TYPE)

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
		RFU_1, RFU_2, PRIVATE_1, PRIVATE_2, PRIVATE_3, DESCRIPTOR_PLACE, DESCRIPTOR_APPOINTMENT , DESCRIPTOR_IDENTIFIER, DESCRIPTOR_PURCHASE, DESCRIPTOR_GET_DATA	
READ:ANALOG:RDS:TAG0_START? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG0_START)
CONF:ANALOG:RDS:TAG0_START <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG0_START)
READ:ANALOG:RDS:TAG0_LENGTH? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG0_LENGTH)
CONF:ANALOG:RDS:TAG0_LENGTH <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG0_LENGTH)
READ:ANALOG:RDS:TAG1_TYPE? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG1_TYPE)
CONF:ANALOG:RDS:TAG1_TYPE <param1> <param2>	0-2	DUMMY, ITEM_TITLE, ITEM_ALBUM, ITEM_TRACKNUMBER, ITEM_ARTIST, ITEM_COMPOSITION, ITEM_MOVEMENT, ITEM_CONDUCTOR, ITEM_COMPOSER, ITEM_BAND, ITEM_COMMENT, ITEM_GENRE, INFO_NEWS, INFO_NEWS_LOCAL, INFO_STOCKMARKET, INFO_SPORT, INFO_LOTTERY, INFO_HOROSCOPE, INFO_DAILY_DIVERSION, INFO_HEALTH, INFO_EVENT, INFO_SCENE, INFO_CINEMA, INFO_TV, INFO_DATE_TIME, INFO_WEATHER, INFO_TRAFFIC, INFO_ALARM, INFO_ADVERTISEMENT, INFO_URL, INFO_OTHER, STATIONNAME_SHORT, STATIONNAME_LONG, PROGRAMME_NOW, PROGRAMME_NEXT, PROGRAMME_PART, PROGRAMME_HOST, PROGRAMME_EDITORIAL_ST AFF, PROGRAMME_FREQUENCY, PROGRAMME_HOMEPAGE, PROGRAMME_SUBCHANNEL, PHONE_HOTLINE, PHONE_STUDIO, PHONE_OTHER, SMS_STUDIO, SMS_OTHER, EMAIL_HOTLINE, EMAIL_STUDIO,	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG1_TYPE)

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
		EMAIL_OTHER, MMS_OTHER, CHAT, CHAT_CENTER, VOTE_QUESTION, VOTE_CENTRE, RFU_1, RFU_2, PRIVATE_1, PRIVATE_2, PRIVATE_3, DESCRIPTOR_PLACE, DESCRIPTOR_APPOINTMENT , DESCRIPTOR_IDENTIFIER, DESCRIPTOR_PURCHASE, DESCRIPTOR_GET_DATA	
READ:ANALOG:RDS:TAG1_START? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG1_START)
CONF:ANALOG:RDS:TAG1_START <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG1_START)
READ:ANALOG:RDS:TAG1_LENGTH? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG1_LENGTH)
CONF:ANALOG:RDS:TAG1_LENGTH <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG1_LENGTH)
READ:ANALOG:RDS:TAG2_TYPE? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG1_TYPE)
CONF:ANALOG:RDS:TAG2_TYPE <param1> <param2>	0-2	DUMMY, ITEM_TITLE, ITEM_ALBUM, ITEM_TRACKNUMBER, ITEM_ARTIST, ITEM_COMPOSITION, ITEM_MOVEMENT, ITEM_CONDUCTOR, ITEM_COMPOSER, ITEM_BAND, ITEM_COMMENT, ITEM_GENRE, INFO_NEWS, INFO_NEWS_LOCAL, INFO_STOCKMARKET, INFO_SPORT, INFO_LOTTERY, INFO_HOROSCOPE, INFO_DAILY_DIVERSION, INFO_HEALTH, INFO_EVENT, INFO_SCENE, INFO_CINEMA, INFO_TV, INFO_DATE_TIME, INFO_WEATHER, INFO_TRAFFIC, INFO_ALARM, INFO_ADVERTISEMENT, INFO_URL, INFO_OTHER, STATIONNAME_SHORT, STATIONNAME_LONG, PROGRAMME_NOW, PROGRAMME_NEXT, PROGRAMME_PART, PROGRAMME_HOST, PROGRAMME_EDITORIAL_ST AFF, PROGRAMME_FREQUENCY, PROGRAMME_HOMEPAGE, PROGRAMME_SUBCHANNEL, PHONE_HOTLINE,	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG1_TYPE)

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
		PHONE_STUDIO, PHONE_OTHER, SMS_STUDIO, SMS_OTHER, EMAIL_HOTLINE, EMAIL_STUDIO, EMAIL_OTHER, MMS_OTHER, CHAT, CHAT_CENTER, VOTE_QUESTION, VOTE_CENTRE, RFU_1, RFU_2, PRIVATE_1, PRIVATE_2, PRIVATE_3, DESCRIPTOR_PLACE, DESCRIPTOR_APPOINTMENT , DESCRIPTOR_IDENTIFIER, DESCRIPTOR_PURCHASE, DESCRIPTOR_GET_DATA	
READ:ANALOG:RDS:TAG2_START? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG2_START)
CONF:ANALOG:RDS:TAG2_START <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG2_START)
READ:ANALOG:RDS:TAG2_LENGTH? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG2_LENGTH)
CONF:ANALOG:RDS:TAG2_LENGTH <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG2_LENGTH)
READ:ANALOG:RDS:TAG3_TYPE? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG3_TYPE)
CONF:ANALOG:RDS:TAG3_TYPE <param1> <param2>	0-2	DUMMY, ITEM_TITLE, ITEM_ALBUM, ITEM_TRACKNUMBER, ITEM_ARTIST, ITEM_COMPOSITION, ITEM_MOVEMENT, ITEM_CONDUCTOR, ITEM_COMPOSER, ITEM_BAND, ITEM_COMMENT, ITEM_GENRE, INFO_NEWS, INFO_NEWS_LOCAL, INFO_STOCKMARKET, INFO_SPORT, INFO_LOTTERY, INFO_HOROSCOPE, INFO_DAILY_DIVERSION, INFO_HEALTH, INFO_EVENT, INFO_SCENE, INFO_CINEMA, INFO_TV, INFO_DATE_TIME, INFO_WEATHER, INFO_TRAFFIC, INFO_ALARM, INFO_ADVERTISEMENT, INFO_URL, INFO_OTHER, STATIONNAME_SHORT, STATIONNAME_LONG, PROGRAMME_NOW, PROGRAMME_NEXT, PROGRAMME_PART, PROGRAMME_HOST,	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG3_TYPE)

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
		PROGRAMME_EDITORIAL_STAFF, PROGRAMME_FREQUENCY, PROGRAMME_HOMEPAGE, PROGRAMME_SUBCHANNEL, PHONE_HOTLINE, PHONE_STUDIO, PHONE_OTHER, SMS_STUDIO, SMS_OTHER, EMAIL_HOTLINE, EMAIL_STUDIO, EMAIL_OTHER, MMS_OTHER, CHAT, CHAT_CENTER, VOTE_QUESTION, VOTE_CENTRE, RFU_1, RFU_2, PRIVATE_1, PRIVATE_2, PRIVATE_3, DESCRIPTOR_PLACE, DESCRIPTOR_APPOINTMENT, DESCRIPTOR_IDENTIFIER, DESCRIPTOR_PURCHASE, DESCRIPTOR_GET_DATA	
READ:ANALOG:RDS:TAG3_START? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG3_START)
CONF:ANALOG:RDS:TAG3_START <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG3_START)
READ:ANALOG:RDS:TAG3_LENGTH? <param1>	0-2		Query respective RT+/eRT+ Open Data Application tag mapping specifications (TAG3_LENGTH)
CONF:ANALOG:RDS:TAG3_LENGTH <param1> <param2>	0-2	0 ~ 63	Set respective RT+/eRT+ Open Data Application tag schema bounds (TAG3_LENGTH)
READ:ANALOG:RDS:ENCODING_FLAG? <param1>	0-2		Query text character set processing configuration matrix flag
CONF:ANALOG:RDS:ENCODING_FLAG <param1> <param2>	0-2	UTF_16, UTF_8	Set character translation matrix mapping protocol behavior (UTF-8 or UTF-16)
READ:ANALOG:RDS:TEXT_DIRECTION? <param1>	0-2		Query string horizontal sweep parsing sequence orientation (LTR or RTL)
CONF:ANALOG:RDS:TEXT_DIRECTION <param1> <param2>	0-2	LTR, RTL	Set text stream orientation geometry processing block profile (LTR or RTL)
READ:ANALOG:RDS:PRG_TYPE_MODE?	0-2		Query targeted regulatory market standard profile mapping rules (RDS or RBDS)
CONF:ANALOG:RDS:PRG_TYPE_MODE <param1> <param2>	0-2	RBDS, RDS	Toggle operational profile parsing rules lookup dictionary type (RDS or RBDS)
READ:ANALOG:RDS:PRG_TYPE? <param1>	0-2		Query current Program Type (PTY) dynamic numerical lookup index

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
CONF:ANALOG:RDS:PRG_TYPE <param1> <param2>	0-2	NO_TYPE, NEWS, CURRENT_AFFAIRS, INFORMATION, SPORTS, EDUCATION, DRAMA, CULTURE, SCIENCE, VARIED, POP_MUSIC, ROCK_MUSIC, EASY_MUSIC, LIGHT_CLASSIC, SERIOUS_CLASSIC, OTHER_MUSIC, WEATHER, FINANCE, CHILDREN, SOCIAL_AFFAIRS, RELIGION, PHONE_IN, TRAVEL, LEISURE, JAZZ_MUSIC, COUNTRY_MUSIC, NATIONAL_MUSIC, OLDIES_MUSIC, FOLK_MUSIC, DOCUMENTARY, ALARM_TEST, ALARM	Assign program content classification registry token to PTY mapping node
READ:ANALOG:RDS:PRG_TYPE_NAME? <param1>	0-2		Query custom string variable identifying active Program Type Name
CONF:ANALOG:RDS:PRG_TYPE_NAME <param1> <param2>	0-2	Max 8-byte Characters	Set custom text overlay tag for dynamic Program Type Name
READ:ANALOG:RDS:AF_MODE? <param1>	0-2		Query current global Alternative Frequency array processing block system toggle
CONF:ANALOG:RDS:AF_MODE <param1> <param2>	0-2	OFF, ON	Toggle calculation framework processing layer for global AF listings
READ:ANALOG:RDS:AF_METHOD? <param1>	0-2		Query selected parsing sequence mapping behavior method A or B
CONF:ANALOG:RDS:AF_METHOD <param1> <param2>	0-2	A, B	Set sorting dictionary profile configuration rules index to Method A or B
READ:ANALOG:RDS:AF_NUM? <param1>	0-2		Query allocated payload array total size limit parameter for dynamic tuning listings
CONF:ANALOG:RDS:AF_NUM <param1> <param2>	0-2	1 ~ 24	Set allocated payload array total size limit index count bounds
READ:ANALOG:RDS:AF_01? <param1>	0-2		Query exact discrete carrier frequency stored at specific Method A target node slot index
CONF:ANALOG:RDS:AF_01 <param1> <param2>	0-2	87.6 ~ 107.9	Store individual destination node frequency point within Method A block profile registry in MHz unit
READ:ANALOG:RDS:AF_02? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_02 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:AF_03? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_03 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_04? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_04 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_05? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_05 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_06? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_06 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_07? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_07 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_08? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_08 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_09? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_09 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_10? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_10 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_11? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_11 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_12? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_12 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_13? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_13 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_14? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_14 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_15? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_15 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_16? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_16 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_17? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_17 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_18? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_18 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:AF_19? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_19 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_20? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_20 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_21? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_21 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_22? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_22 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_23? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_23 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_24? <param1>	0-2		the same as AF_01
CONF:ANALOG:RDS:AF_24 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_01
READ:ANALOG:RDS:AF_NUM_SAME? <param1>	0-2		Query the total number of Alternative Frequencies (AF) defined in the Method B identical/same program list
CONF:ANALOG:RDS:AF_NUM_SAME <param1> <param2>	0-2	1 ~ 24	Set the total number of Alternative Frequencies (AF) to be used in the Method B identical/same program list
READ:ANALOG:RDS:AF_SAME_01? <param1>	0-2		Query the specific tuning frequency stored at the 1st index of the Method B identical/same program list
CONF:ANALOG:RDS:AF_SAME_01 <param1> <param2>	0-2	87.6 ~ 107.9	Set the tuning frequency for the 1st index of the Method B identical/same program list in MHz units
READ:ANALOG:RDS:AF_SAME_02? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_02 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_03? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_03 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_04? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_04 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_05? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_05 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_06? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_06 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_07? <param1>	0-2		the same as AF_SAME_01

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
CONF:ANALOG:RDS:AF_SAME_07 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_08? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_08 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_09? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_09 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_10? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_10 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_11?	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_11 <param1><param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_12? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_12 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_13? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_13 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_14? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_14 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_15? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_15 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_16? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_16 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_17? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_17 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_18? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_18 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_19? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_19 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_20? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_20 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_21? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_21 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_22? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_22 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_23? <param1>	0-2		the same as AF_SAME_01

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
CONF:ANALOG:RDS:AF_SAME_23 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_SAME_24? <param1>	0-2		the same as AF_SAME_01
CONF:ANALOG:RDS:AF_SAME_24 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_SAME_01
READ:ANALOG:RDS:AF_NUM_VARIANT? <param1>	0-2		Query total count parameters processing limit bounding Method B variant grouping array sizes
CONF:ANALOG:RDS:AF_NUM_VARIANT <param1> <param2>	0-2	1 ~12	Establish dimension upper operational boundary definitions for local shift grouping array parameters
READ:ANALOG:RDS:AF_VARIANT_01? <param1>	0-2		Query regional dynamic frequency allocation target variable paired under Method B rule bindings
CONF:ANALOG:RDS:AF_VARIANT_01 <param1> <param2>	0-2	87.6 ~ 107.9	Configure alternate mapping offset reference parameters point target node for Method B arrays
READ:ANALOG:RDS:AF_VARIANT_02? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_02 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_03? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_03 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_04? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_04 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_05? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_05 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_06? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_06 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_07? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_07 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_08? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_08 <param1><param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_09? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_09 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_10? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_10 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_11? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_11 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01
READ:ANALOG:RDS:AF_VARIANT_12? <param1>	0-2		the same as AF_VARIANT_01
CONF:ANALOG:RDS:AF_VARIANT_12 <param1> <param2>	0-2	87.6 ~ 107.9	the same as AF_VARIANT_01

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:PIN_DAY?			Query operational countdown trigger boundaries defined inside dynamic PI Schedule registry(DAY)
CONF:ANALOG:RDS:PIN_DAY <param2>		1 ~ 31	Establish definitive calendar deadline scheduling metrics bound inside Group Type 1A packet nodes(DAY)
READ:ANALOG:RDS:PIN_HOUR?			Query operational countdown trigger boundaries defined inside dynamic PI Schedule registry(HOUR)
CONF:ANALOG:RDS:PIN_HOUR <param2>		0 ~ 23	Establish definitive calendar deadline scheduling metrics bound inside Group Type 1A packet nodes(HOUR)
READ:ANALOG:RDS:PIN_MINUTE?			Query operational countdown trigger boundaries defined inside dynamic PI Schedule registry(MIN)
CONF:ANALOG:RDS:PIN_MINUTE <param2>		0 ~ 59	Establish definitive calendar deadline scheduling metrics bound inside Group Type 1A packet nodes(MIN)
READ:ANALOG:RDS:TIME?			Query real-time dynamic Clock Time / Date (CT) synchronization broadcast system tracking status
CONF:ANALOG:RDS:TIME <param1> <param2>		OFF, ON	Query real-time dynamic Clock Time / Date (CT) synchronization broadcast system tracking status
READ:ANALOG:RDS:YEAR?			Query system constant time date components assigned inside static clock frame registry elements(YEAR)
CONF:ANALOG:RDS:YEAR <param2>		1900 ~ 2200	Manually update target date elements configuration fields parameters feeding clock generation hardware (YEAR)
READ:ANALOG:RDS:MONTH?			Query system constant time date components assigned inside static clock frame registry elements(MONTH)
CONF:ANALOG:RDS:MONTH <param2>		1 ~ 12	Manually update target date elements configuration fields parameters feeding clock generation hardware (MONTH)
READ:ANALOG:RDS:DAY?			Query system constant time date components assigned inside static clock frame registry elements(DAY)
CONF:ANALOG:RDS:DAY <param2>		1 ~ 31	Manually update target date elements configuration fields parameters feeding clock generation hardware (DAY)

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
READ:ANALOG:RDS:HOUR?			Query system constant time date components assigned inside static clock frame registry elements(HOUR)
CONF:ANALOG:RDS:HOUR <param2>		0 ~ 23	Manually update target date elements configuration fields parameters feeding clock generation hardware (HOUR)
READ:ANALOG:RDS:MINUTE?			Query system constant time date components assigned inside static clock frame registry elements(MIN)
CONF:ANALOG:RDS:MINUTE <param2>		0 ~ 59	Manually update target date elements configuration fields parameters feeding clock generation hardware (MIN)
READ:ANALOG:RDS:LTO?			Query current system dynamic Local Time Offset (LTO) calculation delta index bounds parameters
CONF:ANALOG:RDS:LTO <param2>		-31 ~ 31	Configure active offset calculation constant tracking time zone deviation value increments
READ:ANALOG:RDS:DI? <param1>	0-2		Query full aggregated binary word mapping for dynamic Decoder Identification configuration vector fields
READ:ANALOG:RDS:DI_MONO_STEREO? <param1>	0-2		Query flag setting defining channel architecture type signature inside active DI telemetry groups
CONF:ANALOG:RDS:DI_MONO_STEREO <param1> <param2>	0-2	MONO, STEREO	Configure operational status telemetry flag marking baseline path footprint as Mono or Stereo signal
READ:ANALOG:RDS:DI_HEAD? <param1>	0-2		Query binary indicator flagging source routing profiling format condition (Binaural Artificial Head)
CONF:ANALOG:RDS:DI_HEAD <param1> <param2>	0-2	NOT_ARTIFICIAL, ARTIFICIAL	Query binary indicator flagging source routing profiling format condition (Binaural Artificial Head)
READ:ANALOG:RDS:DI_COMPRESSED? <param1>	0-2		Query binary configuration state checking whether dynamic range audio audio processing processing is enabled
CONF:ANALOG:RDS:DI_COMPRESSED <param1> <param2>	0-2	NO, YES	Assign operational signaling bit declaring source processing environment path features dynamic code reduction
READ:ANALOG:RDS:DI_PTY? <param1>	0-2		Query diagnostic configuration element flag evaluating baseline operational definition mapping rules (Static or Dynamic PTY)
CONF:ANALOG:RDS:DI_PTY <param1> <param2>	0-2	STATIC, DYNAMIC	Set system operation processing layer indicator marking PTY

COMMAND	<param1> Channel #	<param2> RANGE	DESCRIPTION
			category lookup routines as fixed structural or variable profile

5.3.5 Analog AM Commands

COMMAND	<param1> RANGE	DESCRIPTION
READ:ANALOG:AM:AM_INDEX?		Query current AM Modulation Index percentage
CONF:ANALOG:AM:AM_INDEX <param1>	0.0 ~ 100.0	Set AM Modulation Index percentage (%)
READ:ANALOG:AM:MODE?		Query current Analog AM audio source mode
CONF:ANALOG:AM:MODE <param1>	MONO, WAVE, SWEEP, EXT_IN	Set Analog AM audio source mode
READ:ANALOG:AM:AUDIO_FREQ?		Query AM mono tone frequency
CONF:ANALOG:AM:AUDIO_FREQ <param1>	0 ~ 20	Set AM mono tone frequency (kHz)
READ:ANALOG:AM:CONTENTS?		Query the filename of the currently selected audio WAVE file for AM
CONF:ANALOG:AM:CONTENTS <param1>	File name	Query the filename of the currently selected audio WAVE file for AM
EXEC:ANALOG:AM:CONTENTS_RST <param1>	0.0 ~ 99.9	Reset AM WAVE file playback position to the specified percentage (%)
READ:ANALOG:AM:WAVE_FS?		Query sampling rate (Fs) of the current AM WAVE file
READ:ANALOG:AM:WAVE_CH?		Query number of channels of the current AM WAVE file
READ:ANALOG:AM:WAVE_BITS?		Query bit depth (resolution) of the current AM WAVE file
READ:ANALOG:AM:SWEEP_START?		Query start frequency for AM audio sweep
CONF:ANALOG:AM:SWEEP_START <param1>	0 ~ 15	Set start frequency for AM audio sweep (kHz)
READ:ANALOG:AM:SWEEP_STOP?		Query stop frequency for AM audio sweep
CONF:ANALOG:AM:SWEEP_STOP <param1>	0 ~ 15	Set stop frequency for AM audio sweep (kHz)
READ:ANALOG:AM:SWEEP_TIME?		Query duration of the AM audio sweep
CONF:ANALOG:AM:SWEEP_TIME <param1>	20 ~ 10000	Set duration of the AM audio sweep (ms)
READ:ANALOG:AM:AUDIO_IN_GAIN?		Query gain value applied to the external audio input for AM
CONF:ANALOG:AM:AUDIO_IN_GAIN <param1>	0 ~ 50	Set gain value for the external audio input for AM (dB)
READ:ANALOG:AM:AUDIO_IN_LEVEL?		Query actual measured input level of the external audio port in AM mode

5.3.6 Audio Analyzer Commands

COMMAND	<param1> RANGE	DESCRIPTION
READ:AUDIO:TRIGGER?		Query active audio waveform snapshot trigger channel configuration selection status
CONF:AUDIO:TRIGGER <param1>	OFF, LEFT, RIGHT	Set audio waveform snapshot hardware dynamic capture trigger channel configuration selection mapping
READ:AUDIO:REF_FREQ_MODE?		Query reference tone detection tracking state logic evaluation engine setup criteria target profile
CONF:AUDIO:REF_FREQ_MODE <param1>	MANUAL, AUTO	Configure internal analyzer signal parsing routine mapping rules criteria mode structure profile type
READ:AUDIO:REF_FREQ_L?		Query current active analytical filter baseline target target value tracking node target bounds metric (Left Channel)
CONF:AUDIO:REF_FREQ_L <param1>	0.4 ~ 20.0	Force lock target analysis parsing tracking center evaluation criteria target threshold vector point (Left Channel, kHz)
READ:AUDIO:REF_FREQ_R?		Query current active analytical filter baseline target target value tracking node target bounds metric (Right Channel)
CONF:AUDIO:REF_FREQ_R <param1>	0.4 ~ 20.0	Force lock target analysis parsing tracking center evaluation criteria target threshold vector point (Right Channel, kHz)
READ:AUDIO:WEIGHTING_FILTER?		Query targeted acoustical psycho-weighting noise analysis baseline filter block profile lookup
CONF:AUDIO:WEIGHTING_FILTER <param1>	OFF, A_WEIGHT, C_WEIGHT, CCIR	Deploy digital processing framework module matching designated sound profiling weighting rules dictionary type
READ:AUDIO:LOWPASS_FILTER?		Query targeted Lowpass Filter BW value
CONF:AUDIO:LOWPASS_FILTER <param1>	OFF, 1kHz, …, 20kHz	Set Lowpass Filter BW values(OFF, or 1kHz unit)
READ:AUDIO:AVG_NUM?		Query maximum array window dimension index parameter set for cumulative data stream averaging blocks.
CONF:AUDIO:AVG_NUM <param1>	1 ~ 100	Configure moving average depth configuration smoothing bounds array sizes tracking elements parameters
READ:AUDIO:CURRENT_AVG_NUM?		Query current tracking count index variable achieved under executing dataset processing sweeps
EXEC:AUDIO:AVG_RESET		Flushes calculation historical cache buffers resetting metric registers variables to base initialization vectors
READ:AUDIO:FREQ_R?		Query dynamically computed tracking frequency point estimations measured from input ports (Right, Hz).
READ:AUDIO:FREQ_L?		Query dynamically computed tracking frequency point estimations measured from input ports (Left, Hz).
READ:AUDIO:PK_PK_R?		Query measured analog peak-to-peak voltage wave potential amplitude envelope profiles values (Right, Vpp)
READ:AUDIO:PK_PK_L?		Query measured analog peak-to-peak voltage wave potential amplitude envelope profiles values (Left, Vpp)
READ:AUDIO:RMS_R?		Query root-mean-square effective voltage baseline scaling estimations evaluated across sampling limits (Right, Vrms)
READ:AUDIO:RMS_L?		Query root-mean-square effective voltage baseline scaling estimations evaluated across sampling limits (Left, Vrms)
READ:AUDIO:Q_PK_R?		Query quasi-peak diagnostic instrumentation evaluation register calculation metrics logs data vectors fields(Right)

COMMAND	<param1> RANGE	DESCRIPTION
READ:AUDIO:Q_PK_L?		Query quasi-peak diagnostic instrumentation evaluation register calculation metrics logs data vectors fields(Left)
READ:AUDIO:SINAD_R?		Query dynamically evaluated Signal-to-Noise and Distortion ratio computation metrics records logs (Right, dB)
READ:AUDIO:SINAD_L?		Query dynamically evaluated Signal-to-Noise and Distortion ratio computation metrics records logs (Left, dB)
READ:AUDIO:THD_R?		Query numeric estimation output mapping total programmatic integer harmonic component ratios tracking grids (Right, %)
READ:AUDIO:THD_L?		Query numeric estimation output mapping total programmatic integer harmonic component ratios tracking grids (Left, %)
READ:AUDIO:THDN_R?		Query notched aggregate sum calculations capturing total residual artifacts plus system distortion tracking ratios (Right, %)
READ:AUDIO:THDN_L?		Query notched aggregate sum calculations capturing total residual artifacts plus system distortion tracking ratios (Left, %)
READ:AUDIO:SEPARATE_R?		Query analytical dynamic separation crosstalk tracking insulation metrics logging index performance profiles (Right, dB)
READ:AUDIO:SEPARATE_L?		Query analytical dynamic separation crosstalk tracking insulation metrics logging index performance profiles (Left, dB)

5.3.7 Setup System Commands

COMMAND	<param1> RANGE	DESCRIPTION
READ:SETUP:SYSTEM:IP_TYPE?		Query network interface addressing mode profile type classification configuration rules
CONF:SETUP:SYSTEM:IP_TYPE <param1>	STATIC, DYNAMIC	Toggle dynamic runtime network interface management binding architecture model configuration schema routine
READ:SETUP:SYSTEM:IP_ADDR?		Query system LAN IP address
CONF:SETUP:SYSTEM:IP_ADDR <param1>	000.000.000.000 - 255.255.255.255	Assign system LAN IP address(IP4)

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