

Service Linking Test Tool

Using RWC2010B/C and RWC2100F

Operation Manual

Version 1.030

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1. Getting Started

This chapter explains how to download and start the SLinking application program.

1.1 Download and Installation

The SLinking application program is provided as a compressed file via email or download link. Uncompress the zip file and install it.

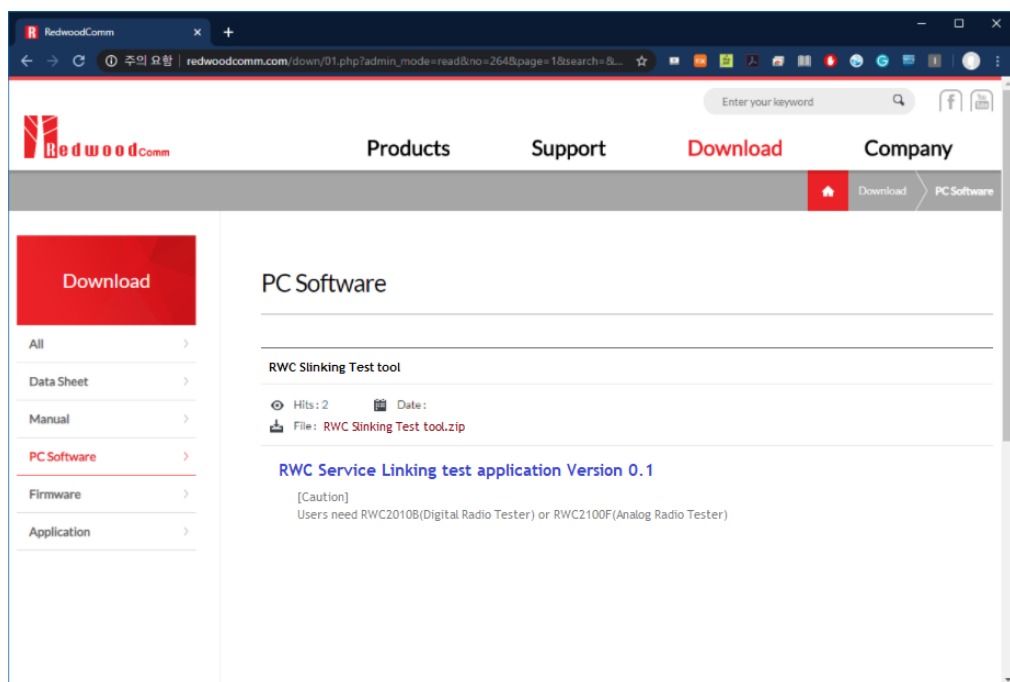


Fig 1.1 Downloading the compressed file from the RedwoodComm website

Figure 1.2 shows an executed screen of the application 'ServiceLinking test tool.exe'.

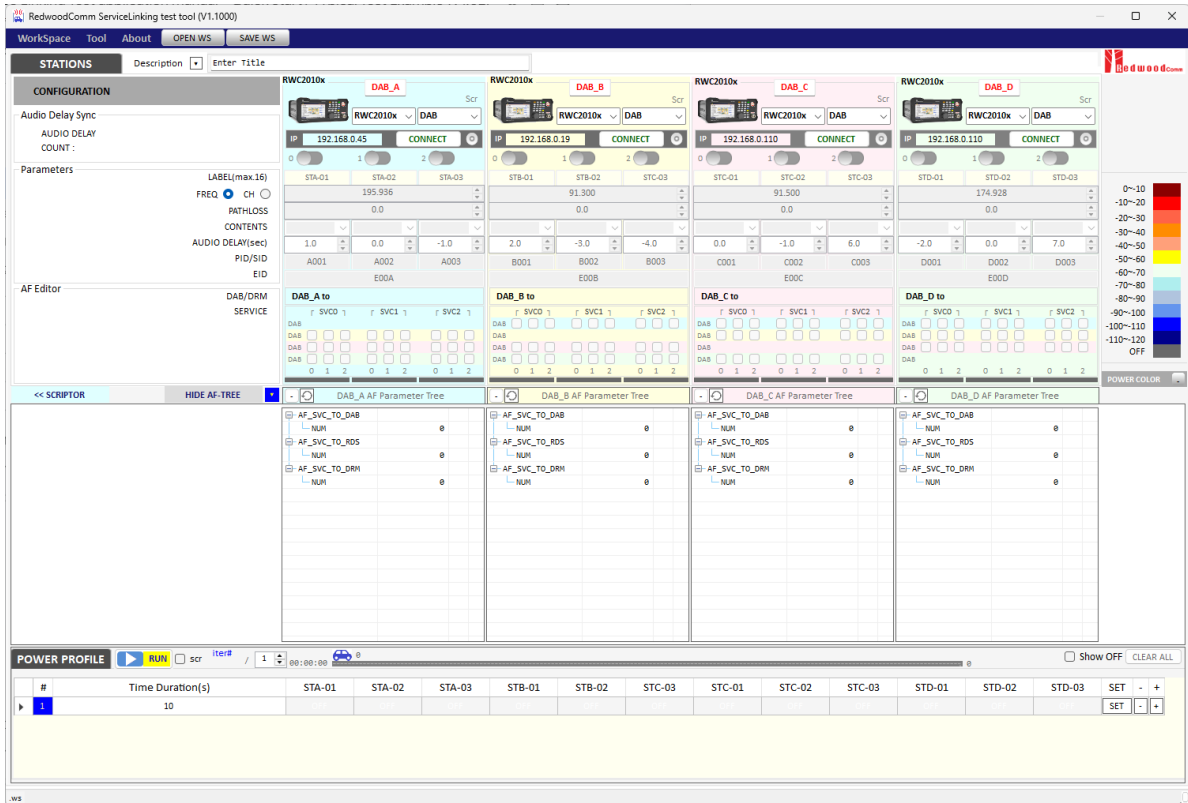


Fig 1.2 Execution screen of the application

Note: PC's OS

1. It only supports Windows, not Linux or IOS .
2. Users are recommended to use windows11 or later versions as OS.
3. To avoid the authorization problem with the OS system, please install this application on a non-system disk, such as 'D drive'.

Language setup

- 1) Users are strongly recommended to use “ ” rather than ‘ ’ for floating expressions.
- 2) Users are strongly recommended to use “ ” rather than ‘ ’ for decimal expressions.
- 3) Users are strongly recommended to use English over other languages.

1.2 General Description

1.2.1 Application Concept

This application provides an easier way to perform service linking testing with AF (Alternate Frequency) of DAB, DRM and FM using RedwoodComm's digital and analog radio testers RWC2010B/C and RWC2100F. It can handle up to four pieces of equipment. Only FM AF tests can be done with one equipment. One or more RWC2010B/Cs and RWC2100F can be used to test any kind of service linking tests. Using RWC2010B/Cs and RWC2100Fs, users can set up to 12 FM, 4 DAB or 4 DRM transmitters. Of course any combination is available.

It provides a simple way to inform AF of other transmitters with checkboxes. It is quite intuitive to create a real AF environment with only clicking checkboxes. It also provides a simple way to make a multi-broadcast signal's power field environment in the user's lab with power profiling.

It automatically sets all AF parameters of connected DAB, DRM and FM transmitters of RWC2010B/C and/or RWC2100F according to the testers' protocol parameters.

The most important thing is to make an audio synchronization with some delay among services or transmitters.

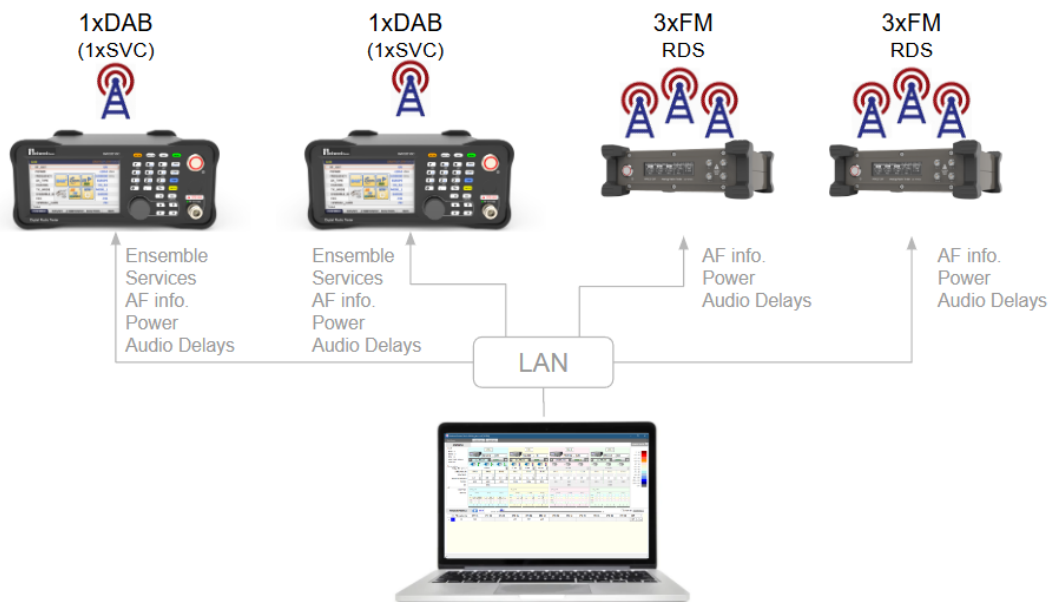


Figure 1.3 Service Linking test environment using RWC2010B/Cs and RWC2100Fs

1.2.2 GUI Structure

The SLinking test application program consists of 3 classified functional windows: Station setup, parameter display, and power profile editor window.

In the station setup window, least parameters for AF information and basic RF parameters can be set. Parameters of RWC2010B/C and/or RWC2100F are configurable such as label, contents file, audio delay, frequency (or service channel index), PID (or SID), and EID. The physical time delay can be defined for each service using the audio delay parameter to emulate a real field broadcasting environment.

In the power profile editor window, transmit power levels of each station can be defined with configurable time duration. In order to test with sequential power values, users can add, remove, or edit power profile data line by line.

In the AF parameter display window, AF parameter trees will be displayed in tree format according to the checked linking connection for all stations and equipment.

All parameters and power profile data can be saved or loaded using the workspace function.

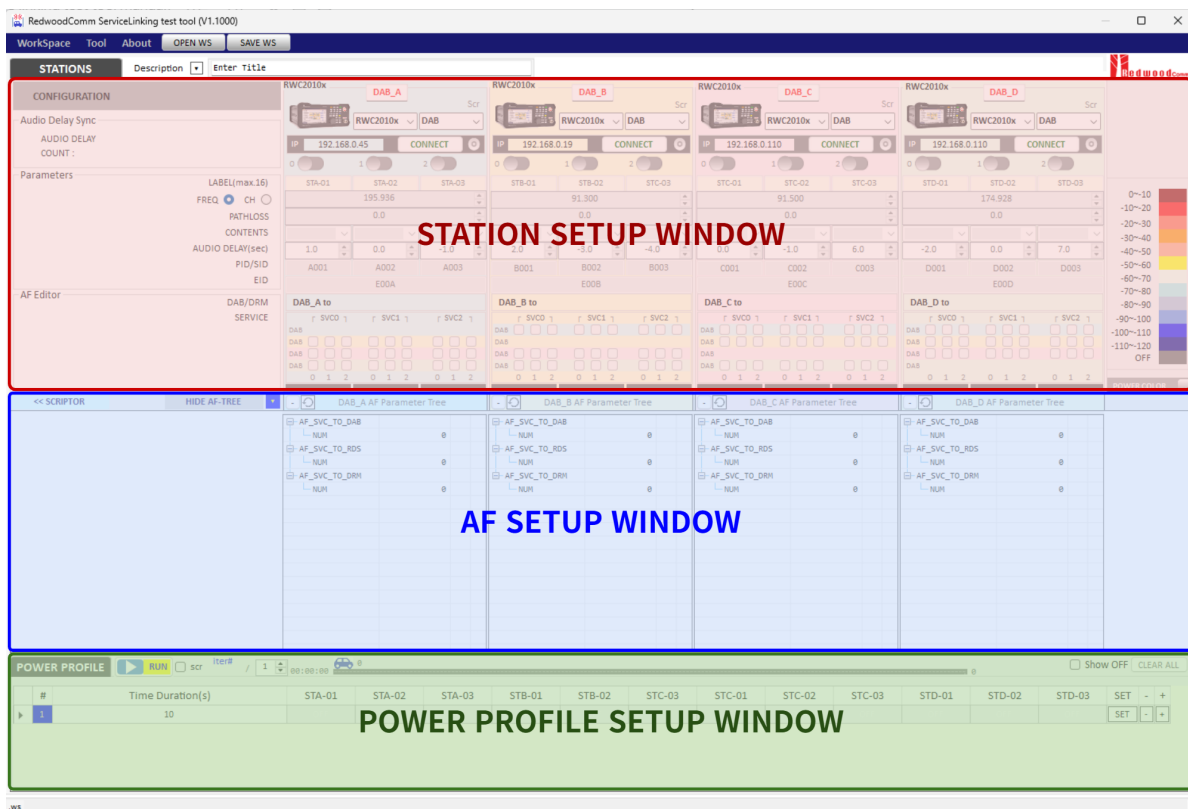


Fig 1.4 Function window classification

1.2.3 Station Setup Window

In the Station setup window, you can connect this application program with each equipment via Ethernet. Each equipment group has 3 on/off buttons, which have different meanings depending on the transmission mode of it. In the case of DAB or DRM, it means 3 services in one multiplex, and in FM transmission mode, it means 3 FM transmitters.

In the DAB mode of RWC2010B/C, 15(or 64) services can be connected to one ensemble. However, for this test application, one ensemble with up to 3 services can be transmitted for test convenience. In the DRM mode of RWC2010B/C, 4 services can be connected to one multiplex. But for convenience of implementation, one multiplexer including up to 3 services can be transmitted. Each service can be turned on or off respectively.

All parameters may look different or have different properties depending on whether the connected equipment is RWC2010B/C or RWC2100F. Some parameters will be visible/invisible, enable/disable according to the on/off status of station, service, and transmit mode of equipment. Some parameters are not editable because of limitations of protocol or equipment RWC2010B/C/RWC2100F. So refer to the detailed description of each parameter.

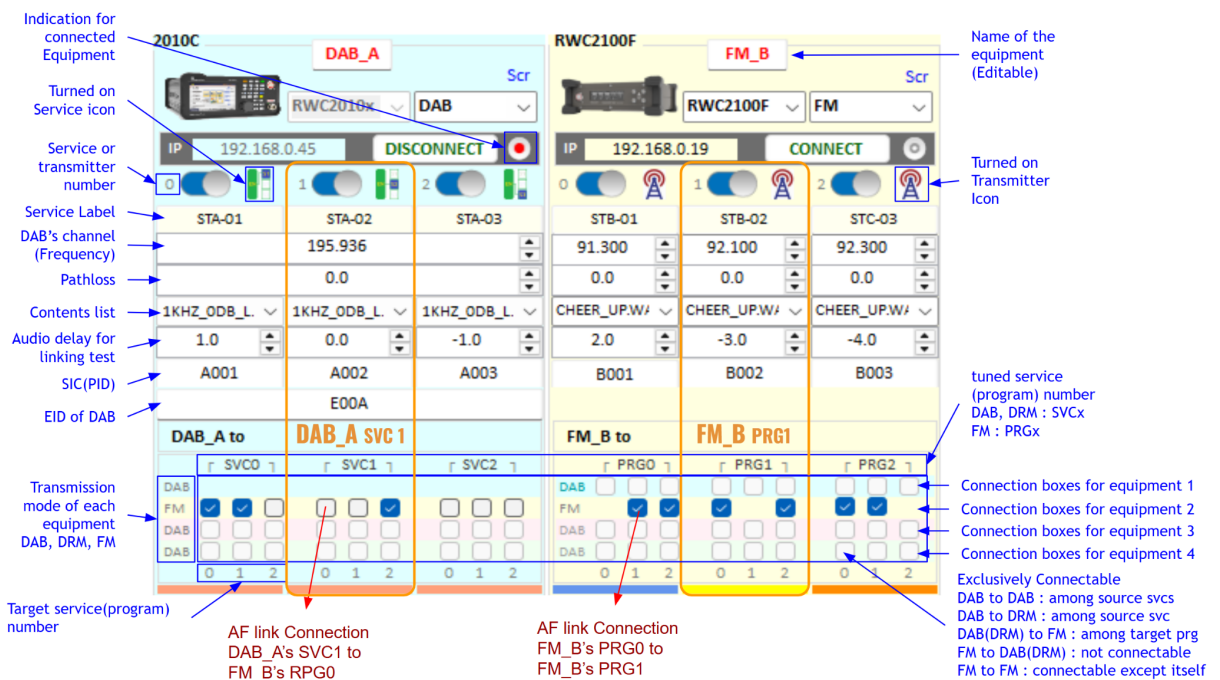
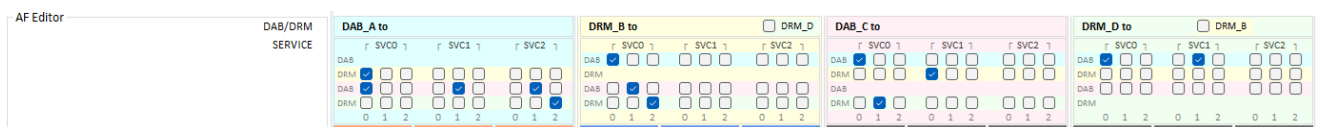


Figure 1.5 Indications and parameters for stations

1.2.4 AF Parameter Display Window

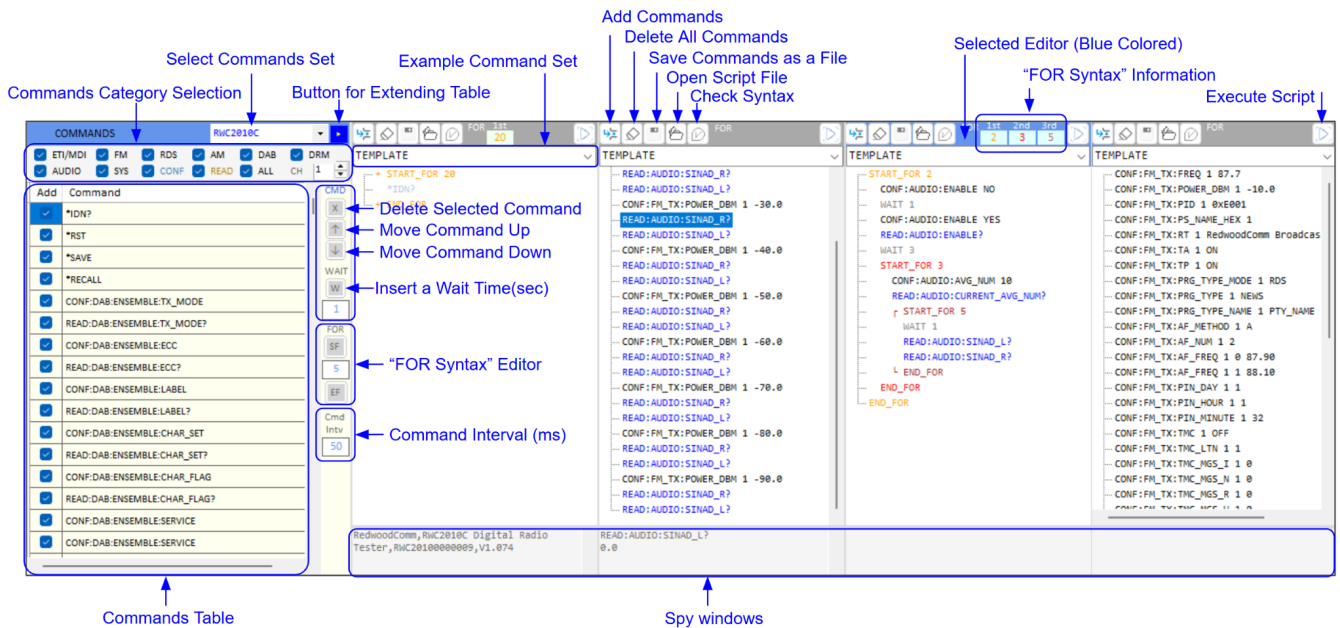
The AF parameter display window automatically creates and shows all AF parameters for each equipment according to the linking connection checkbox. Editing AF parameters in the display window is not allowed.



a. An example of AF link connections of DAB, and DRM

DAB_A AF Parameter Tree	DRM_B Commander	DAB_C AF Parameter Tree	DRM_D Commander
AF_SVC_TO_DAB NUM 3 AF_00 TUNED_SVC SERVICE_00 ILS NATIONAL OTHER_SID C001 HEX OTHER_EID E00C HEX OTHER_FREQ 174.928 MHz CEI LONG_TERM LSN 1 S/H HARD_LINK LA ACTIVE_LINK AF_01 TUNED_SVC SERVICE_01 ILS NATIONAL OTHER_SID C002 HEX OTHER_EID E00C HEX OTHER_FREQ 174.928 MHz CEI LONG_TERM LSN 1 S/H HARD_LINK LA ACTIVE_LINK AF_02 TUNED_SVC SERVICE_02 ILS NATIONAL OTHER_SID C002 HEX OTHER_EID E00C HEX OTHER_FREQ 174.928 MHz	AF_DRM_TO_DRM NUM 0 AF_SVC_TO_DRM NUM 1 AF_00 TUNED_SVC SERVICE_0 ILS NATIONAL OTHER_SID D003 HEX OTHER_FREQ 91.900 MHz SAME_SE... YES AF_SVC_TO_RDS NUM 0 AF_SVC_TO_DAB NUM 2 AF_00 TUNED_SVC SERVICE_0 ILS NATIONAL OTHER_SID A001 HEX OTHER_FREQ EU_8A SAME_SE... YES AF_01 TUNED_SVC SERVICE_0 ILS NATIONAL OTHER_SID C002 HEX OTHER_FREQ EU_5A SAME_SE... YES	AF_SVC_TO_DAB NUM 1 AF_00 TUNED_SVC SERVICE_00 ILS NATIONAL OTHER_SID A001 HEX OTHER_EID E00A HEX OTHER_FREQ 195.936 MHz CEI SHORT_TERM LSN 1 S/H HARD_LINK LA ACTIVE_LINK AF_SVC_TO_RDS NUM 0 AF_SVC_TO_DRM NUM 2 AF_00 TUNED_SVC SERVICE_00 ILS NATIONAL OTHER_SID D002 HEX OTHER_FREQ 91.900 MHz CEI SHORT_TERM LSN 1 S/H HARD_LINK AF_01 TUNED_SVC SERVICE_01 ILS NATIONAL	AF_DRM_TO_DRM NUM 0 AF_SVC_TO_DRM NUM 0 AF_SVC_TO_DAB NUM 2 AF_00 TUNED_SVC SERVICE_0 ILS NATIONAL OTHER_SID A001 HEX OTHER_FREQ EU_8A SAME_SE... YES AF_01 TUNED_SVC SERVICE_1 ILS NATIONAL OTHER_SID A002 HEX OTHER_FREQ EU_8A SAME_SE... YES

b. AF parameters trees according to checked link connections



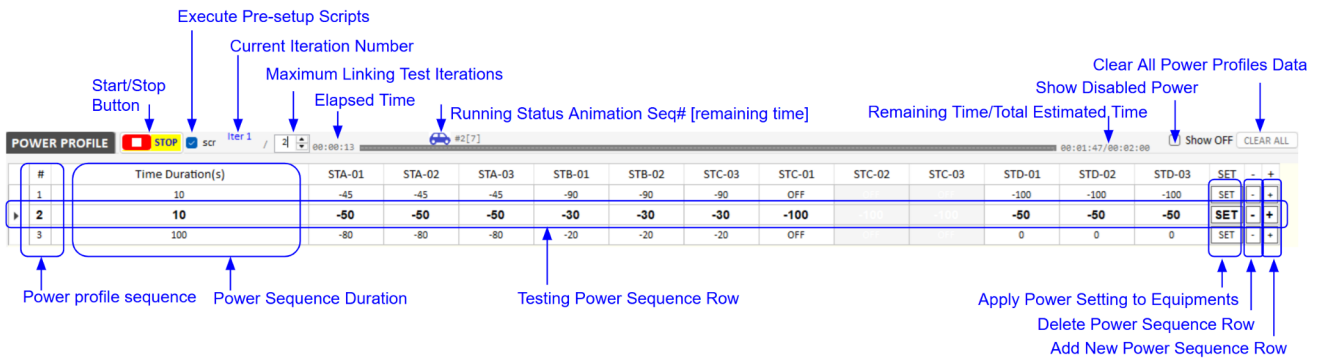
c. Scriptor Editor

Figure 1.6 AF parameters, Scriptor editor window

Click the button to show or hide the AF tree display window.

1.2.5 Power Profile Editor

It provides the power profile window so that users can create a radio broadcasting signal environment of various transmitters that can occur in the real field. In the power profile window, the power levels of each transmitter can be set to emulate the real field situation. All power values are automatically checked and limited to fit the characteristics of RWC2010B/C or RWC2100F.



The screenshot shows the Power Profile Editor interface with the following components and annotations:

- Annotations:**
 - Execute Pre-setup Scripts
 - Start/Stop Button
 - Current Iteration Number
 - Maximum Linking Test Iterations
 - Elapsed Time
 - Running Status Animation Seq# [remaining time]
 - Remaining Time/Total Estimated Time
 - Clear All Power Profiles Data
 - Show Disabled Power
 - Show OFF
 - CLEAR ALL
 - Power profile sequence
 - Power Sequence Duration
 - Testing Power Sequence Row
 - Apply Power Setting to Equipments
 - Delete Power Sequence Row
 - Add New Power Sequence Row
- Table Data:**

#	Time Duration(s)	STA-01	STA-02	STA-03	STB-01	STB-02	STC-03	STC-01	STC-02	STC-03	STD-01	STD-02	STD-03	SET	+	-
1	10	-45	-45	-45	-90	-90	-90	OFF			-100	-100	-100	SET	-	+
2	10	-50	-50	-50	-30	-30	-30	-100			-50	-50	-50	SET	-	+
3	100	-80	-80	-80	-20	-20	-20	OFF			0	0	0	SET	-	+

Figure 1.7 Power profile editor

2. Menu

The parameters and power profile can be saved into and recalled from the users' workspaces. This chapter explains how to use workspaces.

2.1 Workspace

The Workspace acts as a central hub for storing and managing all of your equipment parameters, link connections, and power profiles. While the application can function without an active workspace, using one is highly recommended. If the program is closed without saving a workspace, only basic parameter data is automatically saved—all custom link connections and power profile data will be permanently lost.

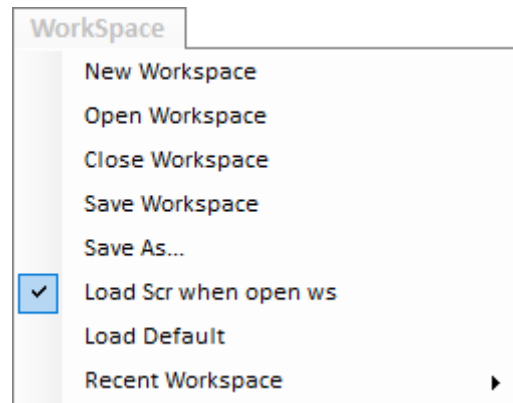


Figure 2.1 Menus for Workspace

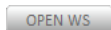
2.1.1 File Management & Access

Managing your workspace files is intuitive, giving you easy ways to start or resume your work:

New, Open, & Close:

You can create a fresh workspace from scratch, open an existing file, or safely close the current session.

When a workspace is active, its name is displayed at the top of the application, and the full directory path is visible at the bottom.



The "Close Workspace" menu will be enabled when a valid workspace is created.

Recent Workspaces

For quick access, the software remembers your workflow and displays a convenient list of the last seven opened workspaces, allowing you to reload them with a single click.

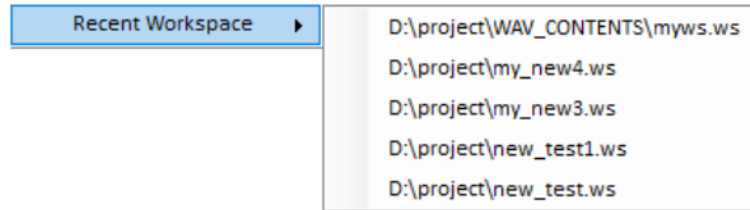


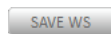
Figure 2.2 Recent Workspace window

2.1.2 Saving & Data Tracking

Ensuring your complex configurations are preserved is critical, and the interface provides clear visual cues regarding your save status:

Save & Save As

You can save your current progress directly or use "Save As" to duplicate the workspace under a new file name. If you click Save on a brand-new, unnamed workspace, a naming dialog box will automatically appear.



Unsaved Changes Indicator

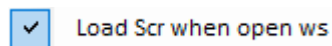
Whenever parameters are modified during a session, an asterisk (*) will appear next to the workspace name at the top of the screen (e.g., my_workspace.ws *). This serves as a helpful reminder to save your progress.

2.1.3 Environment Configuration

The workspace menu also provides tools to automate or reset your working environment:

Automated Script Loading

By checking the [] Load Scr when open ws option, the application will automatically load any specific script files associated with that workspace as soon as it is opened, saving you setup time.



Factory Reset (Load Default)

If you need a clean slate, this command instantly resets all parameters back to their original factory default values. A confirmation dialog will appear first to prevent accidental data loss.

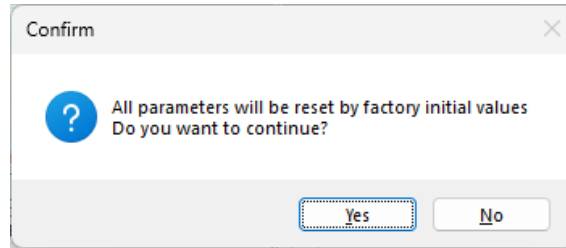


Figure 2.3 Warning Window for Factory Reset

2.2 Tool

This section covers the available diagnostic and monitoring utilities within the application menu.

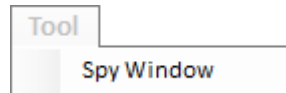


Figure 2.4 Tool Menu

2.2.1 Spy Window

To access the diagnostic console, navigate to the main menu bar and select Tool > Spy Window. Opening this tool will launch the SPY MESSAGE window, which provides a real-time output stream of backend processes, specifically useful for monitoring the execution of the FM generator implementation.



Figure 2.5 Spy Window

Interface Controls

At the top of the SPY MESSAGE window, you will find two primary toggle controls used to filter or augment the log data. The main text area continuously updates with system events, statuses, and performance metrics. Typical log entries you can monitor here include:

☐ Show Rmt cmd

Check this box to display incoming or outgoing remote commands within the log stream.

☐ StopWatch

Check this box to append precise execution times and elapsed time metrics to the log entries.

SAVE

Click this button to export and save all the log data currently displayed on the SPY MESSAGE window naming with workspace and timing information.

2.3 About

The About menu serves as the primary resource for application support, documentation, and software details.

2.3.1 Manual

Clicking this option opens the comprehensive user guide. It provides detailed instructions, parameter explanations, and functional overviews for utilizing the application and managing connected equipment.

2.3.2 Upgrad information

This function displays release notes and information regarding recent software updates. It keeps users informed about new features, enhancements, or bug fixes applied to the current version.

When a discrepancy between your installed version and the latest version is detected, the dialog offers a direct path to upgrade

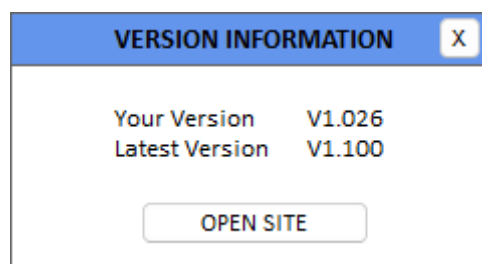


Figure 2.6 Version Information Window

OPEN SITE

Clicking this button will automatically direct you to the official software download or support webpage, allowing you to easily retrieve and install the newest application update.

2.3.3 Application Information

Selecting this item reveals the specific details of the software currently in use. This typically includes the

application version number, build date, and copyright information, which are highly useful when verifying system requirements or seeking technical support.

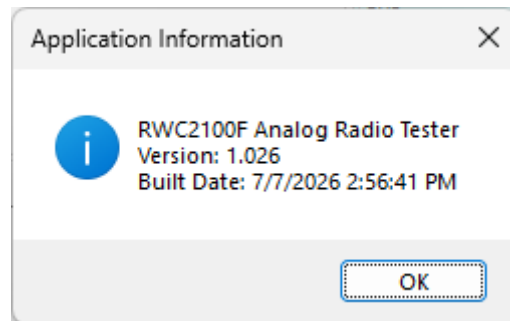


Figure 2.7 Version Information Window

3. Operation

3.1 Station Setup

This section outlines the configuration of broadcasting stations using the connected hardware. The system's total emulation capacity depends on the specific models and the number of units connected to the application:

RWC2010B/C : A single unit can emulate one DAB (or DRM) station, or three FM stations.

RWC2100F : A single unit can emulate up to three FM stations.

For complex testing environments requiring multiple signals, the application supports multi-device configurations. By utilizing a combined setup of four RWC2010B/C and an RWC2100F, the system can scale to emulate a maximum of 4 DAB (or DRM) stations and up to 12 FM stations simultaneously

3.1.1 Equipment Setup

3.1.1.1 Connecting Equipment to The Application

To use this application, at least one RedwoodComm's equipment RWC2010B/C, or RWC2100F(hereinafter referred to as Equipment) must be connected. It doesn't matter if the equipment is RWC2010B/C or RWC2100F.

After setting the IP and clicking the [CONNECT] button, this application program sends the command “*IDN?” to the connected equipment, and from the returned response, distinguishes whether the connected equipment is RWC2010B/C or RWC2100F. It is not allowed to connect a different equipment to the same IP address, showing the warning message shown as Figure 3.1.

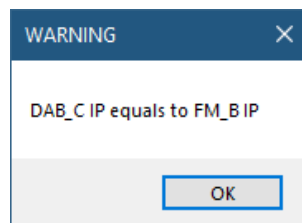


Figure 3.1. Warning message about attempts to connect to the same IP address

After connecting correctly, it updates the basic information of the equipment such as its name and image, and connection status, and the list of contents files. If there is no RWC2010B/C or RWC2100F information from the response, it will ignore the connection and every parameter will not be changed. If the connected equipment is not the same with workspace data, a warning message will be popped. Figure 3.2.

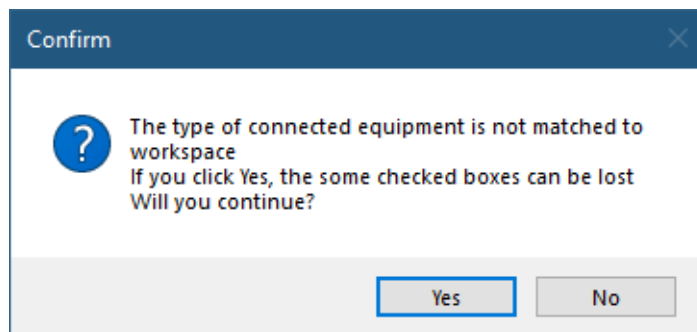
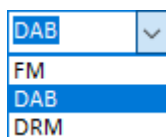


Figure 3.2 Warning message about different equipment to be connected.

3.1.1.2 Transmission Mode

If the connected equipment is RWC2010B/C, the mode option is set to FM, DAB, and DRM. In the case of RWC2100F, only a FM mode option is available.



a. Transmission mode of RWC2010B/C



b. Transmission mode of RWC2100F

Figure 3.3. Transmission of equipment

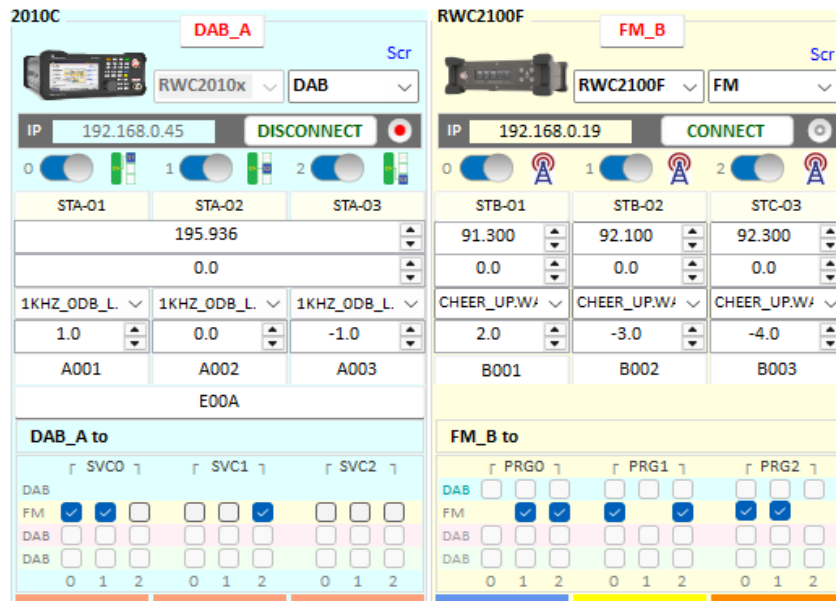
3.1.1.3 Turning on/off Service or Transmitter.

Users can turn on or off each service or transmitter of equipment using the button .

In the case of DAB or DRM, turning on/off the object means adding or removing a service, Figure 3.4.a. In the case of FM, turning on/off the object means turning on/off a FM transmitter, Figure 3.4.b.

Any combinations of DAB, DRM, and FM are allowed. For example, if 2 RWC2010B/C and 2 RWC2100F are connected and one DAB, one DRM, and 6 FMs are selected, the service-linking test can be performed with 8 transmitters. If 4 pieces of any equipment are connected and set as FMs, the service-linking test can be set up with up to 12 FM transmitters.

Checking the checkbox means to add related AF information for service linking. This application program adds AF parameters according to the checked link connection and updates all equipment's AF information.



a. DAB/DRM multi-services b. FM stations

Figure 3.4. Sub-stations of each transmission mode.

3.1.2 Parameters for Stations

This application program only provides least parameters for the service linking test. Therefore, in order to set detailed parameters, it is necessary to set each equipment by remote control or use the application program of the equipment. Each AF frequency and the number of AF for the service linking test is set automatically by the application program when the power profile is executed.

CHANNEL

FREQ ☐ CH ☒

DAB : European channel list of DAB

It can be used when up to four units of DAB-mode equipment are connected.

FREQUENCY

FREQ ☒ CH ☐

The Frequency parameter can be used in any transmit mode of the instrument. However, when there exists the DRM and DAB mode equipment at the same time, the frequency selection button is not visible because the DRM AF information stores DAB channel information with only channel information not with frequency.

DAB : local frequency : 47 - 60, 76 - 108, 174 - 250MHz

DRM : local frequency : 0.15 - 30, 47 - 68MHz

FM local Frequency : 76 - 107.9MHz

PATHLOSS

The Path Loss setting allows users to compensate for signal attenuation caused by RF cables or test fixtures between the equipment and the DUT (Device Under Test). By entering the loss value, the equipment automatically adjusts the RF power to ensure accurate testing.

LABEL

DAB, DRM : This parameter stands for the name of Service. The maximum length of the string is 16.

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

CONTENTS

Users can select one of the AUDIO SOURCE parameters as an audio source.

Application lists up compatible contents files according to the transmission mode after connection with equipment.

AUDIO DELAY

This parameter can be used to emulate the asynchronous nature of each station's contents file due to the physical distance of each station or processing delay. The service linking characteristics of the receiver can be emulated by using the received signals with different audio delays. This parameter is automatically processed by the application, which sends the audio reset commands sequentially, starting with the station having the shortest audio delay when the power profile is executed .

Unit: 100 ms

PID(SID)

PID : FM

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

SID : DAB, DRM

This is the Service Identifier of a Program in DAB/DRM transmitter.

EID

This is the Ensemble Identifier of a DAB transmitter. The maximum digit is 8 in HEX.

For more detailed information, refer to the manual of RWC2010B/C and RWC2100F.

3.1.3. Alternative Frequency

3.1.3.1 AF editor

This program can use all AF functions of RWC2010B/C and RWC2100F to perform service connection tests. Users can set AF information combinations using checkboxes without having to check the details of other configured transmitters. AF Editor provides a very easy and reliable way to set AF parameters by scanning all active multiplexes, services, programs and then activating valid checkboxes.

If you modify parameters using the Scriptor, you must click  to update the AF tree. However, if you execute the Scriptor by clicking the [RUN] button, the application will automatically update the AF tree.

DAB_A to									
	SVC0			SVC1			SVC2		
DAB									
FM	☐	☒	☒	☒	☐	☐	☐	☐	☐
DAB	☐	☐	☐	☐	☐	☐	☐	☐	☐
DAB	☐	☐	☐	☐	☐	☐	☐	☐	☐
	0	1	2	0	1	2	0	1	2

a. AF parameters configuration of the application

DAB		ALTERNATIVE_FREQ	010	RMT	ALC	CAP	ETH	EXT	FCN	
RF	☒	AF_SVC_TO_RDS								
MOD	☒	NUM 1								
POWER	-10.0 dBm	AF_00								
FREQ	174.928 M	TUNED_SVC SERVICE_00								
		OTHER_PID 0xE001								
		ILS NATIONAL								
		OTHER_FREQ 87.6 MHz								
		CONTINUITY ON								
		REGION_ID 0								
		TOGGLE								
		ENSEMBLE	SERVICE	COMPONENT	FUNCTION	INFO				

b. AF parameter screen of the RWC2010C

DAB_A AF parameters	
☒	☒

c. Synchronization AF parameters between the application and the RWC2010x.

Figure 3.5 AF parameter Editing

3.1.3.2 AF Parameter Tree for DAB

There are 4 AF parameter trees for DAB, such as AF_DAB_TO_DAB, AF_SVC_TO_DAB, AF_SVC_TO_RDS, and AF_SVC_TO_DRM.

DAB_A AF Parameter Tree	
AF_SVC_TO_DAB	
NUM	0
AF_SVC_TO_RDS	
NUM	0
AF_SVC_TO_DRM	
NUM	0

Figure 3.6 DAB mode AF parameter tree

AF_SVC_TO_DAB

This tree is for indicating a DAB service to other DAB services. It will be created if SVC to DAB link

connection checkboxes are checked.

	SVC0			SVC1			SVC2		
DAB	☒	☐	☐	☒	☐	☐	☒	☐	☐
DAB	☐	☐	☐	☐	☐	☐	☐	☐	☐
DRM	☐	☐	☐	☐	☐	☐	☐	☐	☐
DAB	☐	☐	☐	☐	☐	☐	☐	☐	☐
	0	1	2	0	1	2	0	1	2

a. Link connection of [DAB SVC to DAB]

AF_SVC_TO_DAB		
NUM		3
AF_00		
AF_01		
TUNED_SVC		SERVICE_01
ILS		NATIONAL
OTHER_SID		0001 HEX
OTHER_EID		0002 HEX
OTHER_FREQ		174.928 MHz
CEI		SHORT_TERM
LSN		1
S/H		HARD_LINK
LA		ACTIVE_LINK
AF_02		
AF_SVC_TO_RDS		
AF_SVC_TO_DRM		

b. AF parameter tree of [DAB SVC to DAB]

Figure 3.7 DAB SVC to DAB AF parameter tree

AF_SVC_TO_RDS

This tree is for indicating a DAB service to other RDS services. It will be created if SVC to FM link connection checkboxes are checked.

	SVC0			SVC1			SVC2		
DAB	☐	☒	☒	☒	☐	☐	☐	☐	☐
FM	☐	☐	☐	☐	☐	☐	☐	☐	☐
DRM	☐	☐	☐	☐	☐	☐	☐	☐	☐
DAB	☐	☐	☐	☐	☐	☐	☐	☐	☐
	0	1	2	0	1	2	0	1	2

a. DAB SVC to RDS link connection

AF_SVC_TO_RDS		
NUM	3	
AF_00		
TUNED_SVC	SERVICE_00	
OTHER_PID	0002	HEX
ILS	NATIONAL	
OTHER_FREQ	92.100	MHZ
CEI	SHORT_TERM	
LSN	1	
LA	ACTIVE_LINK	
S/H	HARD_LINK	
AF_01		
AF_02		
TUNED_SVC	SERVICE_01	
OTHER_PID	0001	HEX
ILS	NATIONAL	

b. DAB SVC to RDS AF parameter tree

Figure 3.8 DAB SVC to RDS AF parameter tree

AF_SVC_TO_DRM

This tree is for indicating a DAB service to other DRM services. It will be created if SVC to DRM link connection checkboxes are checked.

	SVC0			SVC1			SVC2		
DAB	☐	☐	☒	☒	☐	☐	☒	☐	☐
DRM	☐	☐	☐	☐	☐	☐	☐	☐	☐
DRM	☐	☐	☐	☐	☐	☐	☐	☐	☐
DAB	☐	☐	☐	☐	☐	☐	☐	☐	☐
	0	1	2	0	1	2	0	1	2

a. DAB SVC to DRM link connection

AF_SVC_TO_DRM		
NUM	3	
AF_00		
TUNED_SVC	SERVICE_00	
ILS	NATIONAL	
OTHER_SID	0003	HEX
OTHER_FREQ	91.300	MHZ
CEI	SHORT_TERM	
LSN	1	
LA	ACTIVE_LINK	
S/H	HARD_LINK	
AF_01		
AF_02		
TUNED_SVC	SERVICE_02	
ILS	NATIONAL	
OTHER_SID	0001	HEX

b. DAB SVC to DRM AF parameter

Figure 3.9 DAB SVC to DRM AF parameter tree

3.1.3.3 AF Parameter Tree for DRM

There are 4 AF parameter trees for DRM, such as AF_DRM_TO_DRM, AF_SVC_TO_DRM, AF_SVC_TO_RDS, and AF_SVC_TO_DAB.

DRM_A AF parameters			
[-] AF_DRM_TO_DRM			
NUM		0	
[-] AF_SVC_TO_DRM			
NUM		0	
[-] AF_SVC_TO_RDS			
NUM		0	
[-] AF_SVC_TO_DAB			
NUM		0	

Figure 3.10 DRM AF parameter tree

AF_DRM_TO_DRM

This tree is for indicating a DRM system to other DRM systems. It will be created if MULTIPLEX link connection checkboxes are checked.

DRM_A to	☒	DRM_B	☒	DRM_C	☒	DRM_D	☒
----------	-------------------------------------	-------	-------------------------------------	-------	-------------------------------------	-------	-------------------------------------

a. DRM to DRM link connection

[-] AF_DRM_TO_DRM			
NUM		3	
[-] AF_00			
OTHER_FREQ		91.300	MHZ
SYNC_MUX		YES	
[-] AF_01			
OTHER_FREQ		91.500	MHZ
SYNC_MUX		YES	
[-] AF_02			
OTHER_FREQ		91.900	MHZ
SYNC_MUX		YES	

b. DRM to DRM AF parameter tree

Figure 3.11 DRM to DRM AF parameter tree

AF_SVC_TO_DRM

This tree is for indicating a DRM service to other DRM services. It will be created if any SVC to DRM link connection checkboxes are checked.

	SVC0			SVC1			SVC2		
DRM	☐	☒	☐	☒	☐	☐	☐	☐	☐
DRM	☐	☐	☐	☒	☐	☐	☒	☐	☐
DRM	☐	☐	☐	☐	☐	☐	☐	☐	☐
	0	1	2	0	1	2	0	1	2

a. DRM SVC to DRM link connection

AF_SVC_TO_DRM	
NUM	4
AF_00	
TUNED_SVC	SERVICE_0
OTHER_SID	0002 HEX
OTHER_FREQ	91.300 MHz
SAME_SE...	YES
AF_01	
AF_02	
AF_03	
TUNED_SVC	SERVICE_2
OTHER_SID	0001 HEX
OTHER_FREQ	91.500 MHz
SAME_SE...	YES

b. DRM SVC to DRM AF parameter tree

Figure 3.12 DRM SVC to DRM AF parameter tree

AF_SVC_TO_RDS

This tree is for indicating a DRM service to other RDS services. It will be created if any SVC to FM link connection checkboxes are checked.

	SVC0			SVC1			SVC2		
DRM	☐	☐	☐	☐	☐	☐	☐	☐	
DRM	☐	☐	☐	☐	☐	☐	☐	☐	
FM	☒	☒	☐	☐	☒	☐	☐	☐	
FM	☐	☐	☐	☒	☐	☐	☐	☐	
	0	1	2	0	1	2	0	1	2

a. DRM SVC to RDS link connection

AF_SVC_TO_RDS			
NUM	4		
AF_00			
TUNED_SVC	SERVICE_0		
OTHER_SID	0001	HEX	
OTHER_FREQ	91.500	MHZ	
SAME_SE...	YES		
AF_01			
AF_02			
AF_03			
TUNED_SVC	SERVICE_1		
OTHER_SID	D002	HEX	
OTHER_FREQ	94.900	MHZ	
SAME_SE...	YES		

b. DRM SVC to RDS AF parameter tree

Figure 3.13 DRM SVC to RDS AF parameter tree

AF_SVC_TO_DAB

This tree is for indicating a DRM service to other DAB services. It will be created if any SVC to DAB link connection checkboxes are checked

	SVC0			SVC1			SVC2		
DRM									
DAB	☒	☐	☐	☐	☐	☐	☐	☐	☐
DAB	☐	☒	☐	☐	☐	☒	☒	☐	☐
DAB	☐	☐	☒	☒	☐	☐	☐	☐	☐
	0	1	2	0	1	2	0	1	2

a. DRM SVC to DAB link connection

AF_SVC_TO_DAB		
NUM	6	
AF_00		
TUNED_SVC	SERVICE_0	
OTHER_SID	0001	HEX
OTHER_FREQ	EU_5A	
SAME_SE...	YES	
AF_01		
AF_02		
AF_03		
TUNED_SVC	SERVICE_1	
OTHER_SID	0001	HEX
OTHER_FREQ	EU_5A	
SAME SE...	YES	

b. DRM SVC to DAB AF parameter tree

Figure 3.14 DRM SVC to DAB AF parameter tree

3.1.3.4 AF Parameter Tree for FM-RDS

There is only one AF parameter tree for FM-RDS, but it shows 3 transmitters AF respectively.

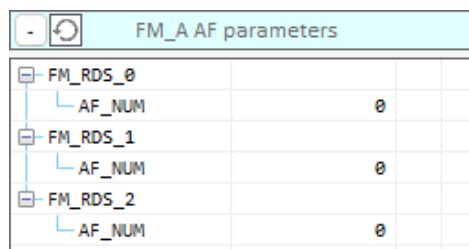
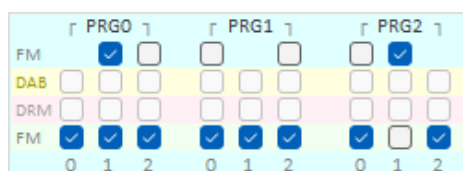


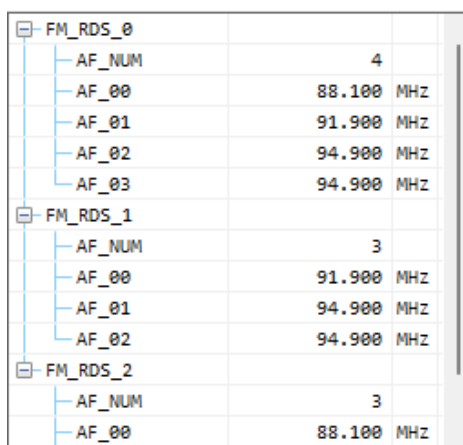
Figure 3.15 FM AF parameter tree

FM_RDS_x

This tree is for indicating other FM transmitter's numbers and frequencies. It will be created if PRG to FM link connection checkboxes are checked



a FM link connections



b FM AF parameter tree with 3 transmitters

Figure 3.16 FM AF parameter tree with 3 transmitters

3.1.3.5 Exclusive Link Connections

Some link connections are not available among transmission mode DAB, DRM, and FM. And some are exclusive to each other. When the exclusive checkbox is checked, the application will make them unchecked automatically in the following way.

Exclusiveness in DAB to DAB and DAB to DRM

If the transmission mode of source equipment is DAB (DRM) and the transmission mode of target is also DAB (DRM), linking from the same source service to different target services is not allowed. This is

because it means that the target services are the same service in one ensemble. Different source services to the same target service link connection or different source services to different target service link connections are allowed as the following figure 3. That is, SVC0(DAB_A) to SVC0(DAB_B) and SVC1(DAB_A) to SVC0(DAB_B) at the same time is not allowed.

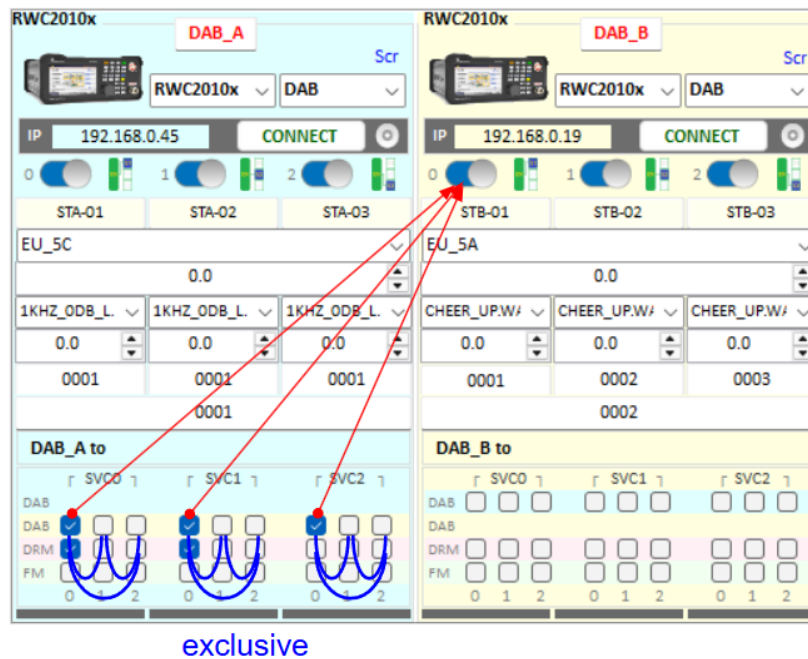


Figure 3.17 Exclusive link connection DAB to DAB

Exclusiveness in DAB(DRM) to FM

In this case, the target is a separate FM transmitter's program even though FM transmitters are in the same equipment. A link connection from different services in the same ensemble to the same FM program is not allowed. For example, the link connection SVC0(DAB_A) to PRG0(FM_B1) and the link connection SVC1(DAB_A) to PRG0(FM_B1) at the same time is not allowed.

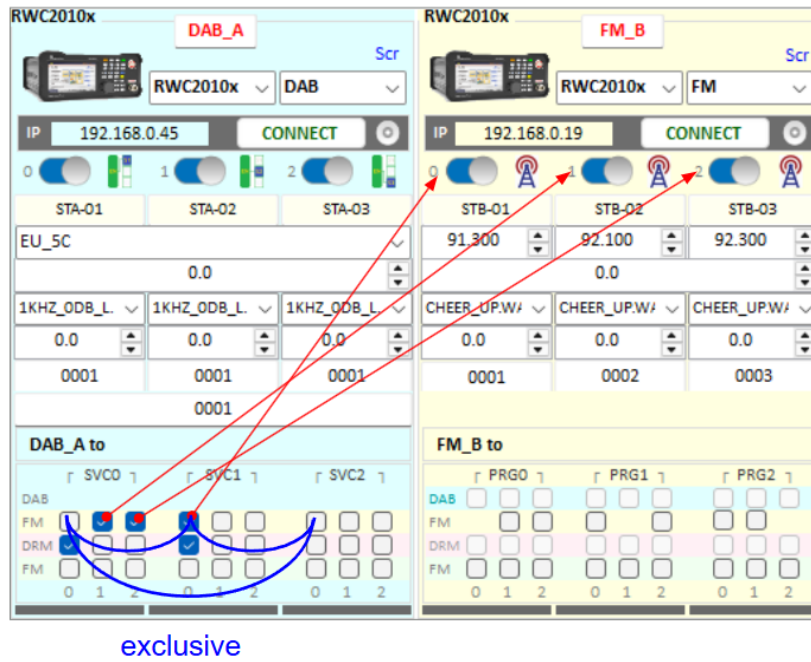


Figure 3.18 Exclusive link connection DAB to FM

Exclusiveness in FM to DAB(DRM)

If there are one DAB transmitter and three FM transmitters, only the AF information checkbox of DAB is active. This is because the DAB can have FM information around it, but it cannot give DAB information to the FM.

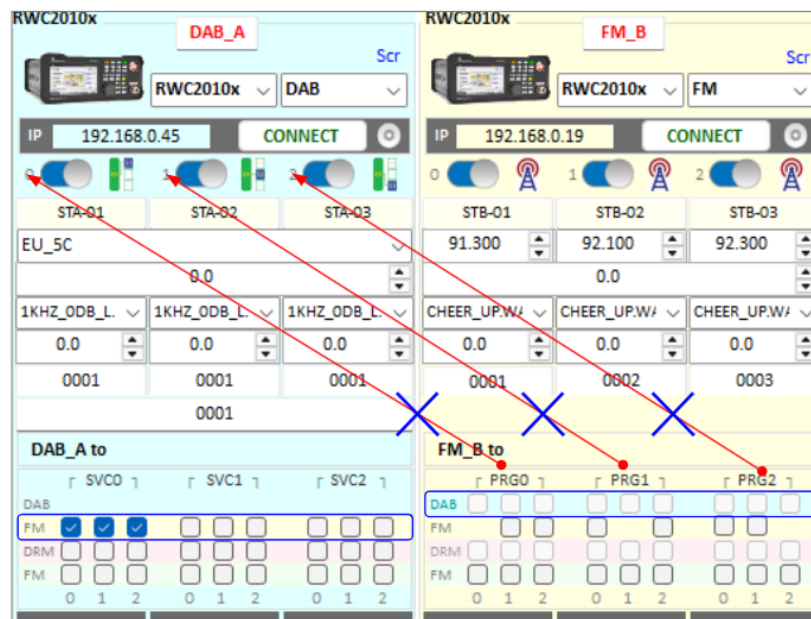


Figure 3.19 Exclusive link connection FM to DAB

Exclusiveness in FM to FM

There is no exclusiveness in FM to FM system. All FM AF link connections can be checked except itself.

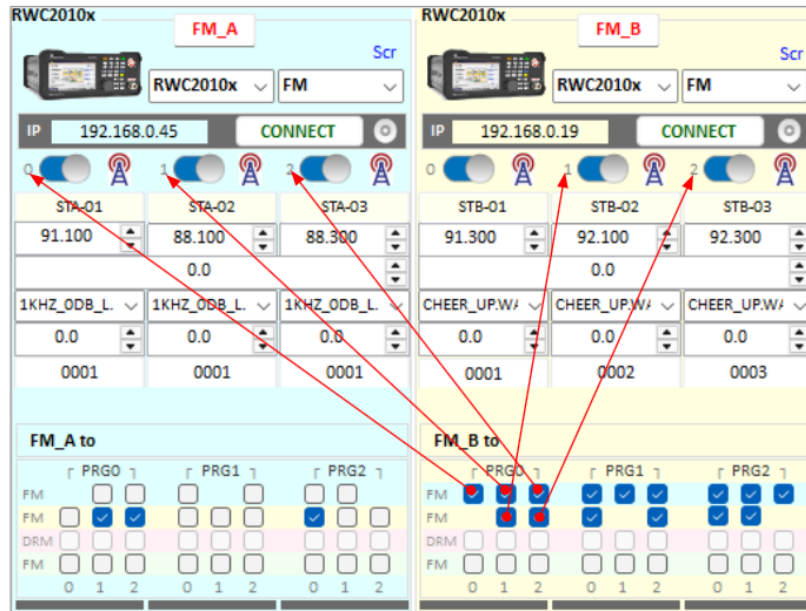


Figure 3.20 Link connection FM to FM

3.1.4 Script Editor

The Script Editor is a comprehensive tool designed to help users build, manage, and execute automated command sequences for the connected equipment. It provides a highly visual and intuitive interface for creating custom scripts.

3.1.4.1 Command Management

Building a script is straightforward. Users can selectively add commands to the editor workspace and organize them as needed.

Editing & Organization

Commands can be edited directly with a simple mouse click. You can rearrange the execution order using directional buttons or by dragging and dropping items.

-  Adding the all selected commands
-  Check the syntax of listed commands
-  Move the selected command up
-  Move the selected command down

Deletion

Unwanted commands can be removed individually (via the delete button or keyboard [DEL] key) or entirely using the Clear function. *Note: Clearing the board is permanent and cannot be undone.*



Delete the all listed commands



, [Del] Key Delete the selected command

3.1.4.2 Flow Control (Logic & Timing)

To create dynamic scripts, the editor supports specific logic and pacing actions:

Wait Action

You can insert a pause (in seconds) between commands, prompting the scripter to wait for a specific duration before proceeding to the next line.



Insert a wait tag



Wait time in second unit

FOR Loops

For repetitive tasks, you can insert START_FOR and END_FOR actions to loop a sequence of commands. The number of iterations is fully customizable, and the editor supports nesting up to three matched sets of these loops.



Insert a START_FOR syntax between commands



FOR loop interaction number



Insert a END_FOR syntax between commands

3.1.4.3 Execution & Monitoring

Once a script is prepared and the RWC2100F is properly connected, the sequence can be executed directly from the editor.

Custom Intervals

The pacing of the script is adjustable; users can modify the command interval time (CmdIntv) in milliseconds.

Visual Tracking

While the script is running, the interface provides real-time feedback by highlighting the active command or action in a yellow box.

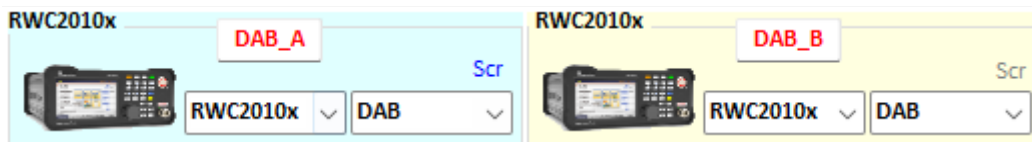
 Run commanding the all listed commands

3.1.4.2 File Operations

To streamline workflows and prevent data loss, the editor includes robust file management features. Users can save their current scripts to a designated folder and open them later for reuse. Additionally, the software provides built-in templates for remote commanding, allowing users to automatically populate the editor with standard, predefined command sequences for quick setup.

-  Save all listed commands as a file(.scr)
-  Open a script file(.scr)

The "Scr" (Script) indicator provides a quick visual cue regarding the status of the Scriptor for each configured equipment block. It allows users to determine at a glance whether automated commands are currently loaded for a specific device.



a. Active Scriptor(blue)

b. Empty Scriptor(gray)

Figure 3.21 Active Scriptor indication

3.2 Power Profile Setup

3.2.1 Editing Power Profile

3.2.1.1 Creating Power Profiles

Power profiles can be created by adding or removing power profile lines with power profile editor.

3.2.1.2 Adding a Power Profile

Clicking the [+] button in the power profile editor will add a new power profile line. If there is not any power profile line, clicking the mouse button in empty space will add a new line. Be aware that default power values are all 'OFF' for safety. If the edited value is invalid, the application will set it as 'OFF' automatically.

3.2.1.3 Removing a Power Profile

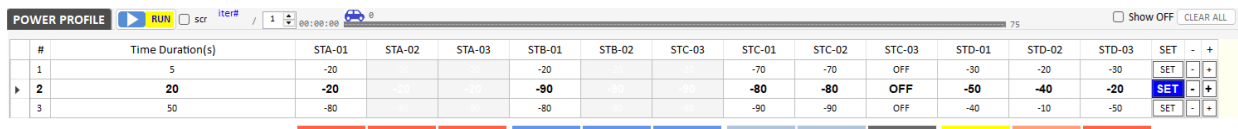
Clicking a [-] button in the power profile editor will remove the power profile line.

3.2.1.4 Modifying Values

Double clicking a specific cell that needs to change will make the cell editable. The sequence number cannot be modified but will be updated after adding or deleting power profile lines automatically.

3.2.1.5 Setting Power Value

Clicking a [SET] button will set the powers of all stations respectively according to the selected profile. The set power profile line is displayed in bold, and each station in the parameter window displays a different color bar according to the set power.



#	Time Duration(s)	STA-01	STA-02	STA-03	STB-01	STB-02	STC-03	STC-01	STC-02	STC-03	STD-01	STD-02	STD-03	SET
1	5	-20			-20			-70	-70	OFF	-30	-20	-30	SET
2	20	-20			-80			-80	-80	OFF	-50	-40	-20	SET
3	50	-80			-80			-90	-90	OFF	-40	-10	-50	SET

Figure 3.22 Setting power levels in the power profile table

3.2.1.6 Power Profile Test Iteration

This is set via the number of interaction input field on the top control panel of the POWER PROFILE. The entire sequence defined in the Power Profile table (e.g., Step 1 -> 2 -> 3) is treated as a single cycle. The system will continuously repeat this cycle for the specified number of iterations.

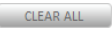
3.2.1.7 []scr

When a test is run with this checkbox selected ([v]scr), all commands currently written in each Script Editor of all stations are executed concurrently before the main Power Profile sequence starts. This feature is highly useful for preparatory tasks required prior to the main test, such as initializing equipment or pre-setting specific parameters. Script file format is compatible with the RWC2010B/C and RWC2100F application.

3.2.1.8 []Show OFF

Setting "[]Show OFF" checked will show all power values of all stations even including stations that are turned off.

3.2.1.9 Clearing All Power Profile Lines

Clicking  button will clear all power profile lines with one warning message. Once cleared, they cannot be recovered.

3.2.2 Parameters for Power Profile Test

Time duration and transmission power of each station can be set.

Time Duration

The time duration indicates the time the corresponding power profile lasts. All stations maintain their set power during this amount of time.

Unit: second

Power

Transmission power level of each station.

With the RWC2010B/C FM transmitter, it is not possible to set different power levels of the three channels. If incorrect values are entered, it will be corrected automatically. In addition, the power can be set to OFF rather than a number, which can emulate that a signal is not received along the moving path by turning the power OFF even if the station is ON. The enable/disable of each station's profile follows the enable/disable of the station setup panel.

Unit: dBm

Range for RWC2010B/C : OFF, 0 to -120 dBm

Range for RWC2100F : OFF, 0 to -90 dBm

OFF can be set.

3.2.3 Power Limitation

With the RWC2010B/C FM transmitter, it is not possible to set different power levels of each transmitter. If different values are set, it will be corrected automatically. With RWC2100F FM transmitter, it is possible to set different power levels of each transmitter independently.

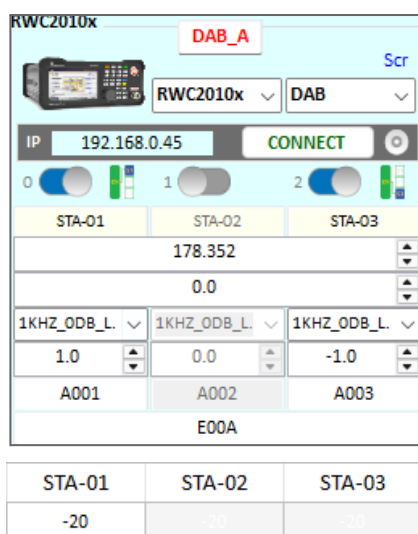
The following are examples by transmission mode and equipment.

Although the RWC2010B/C is set as a DAB and three services are enabled, only one transmit power setting is active because it is one ensemble. Figure 3.24.a

Although the RWC2010B/C is set as a DRM and two services are active, only one transmit power setting is active because it is one multiplex. Figure 3.24.b

Although the RWC2010B/C is set as FM mode and two transmitters are active, all power levels of each FM transmitter will be synchronized. Figure 3.24.c

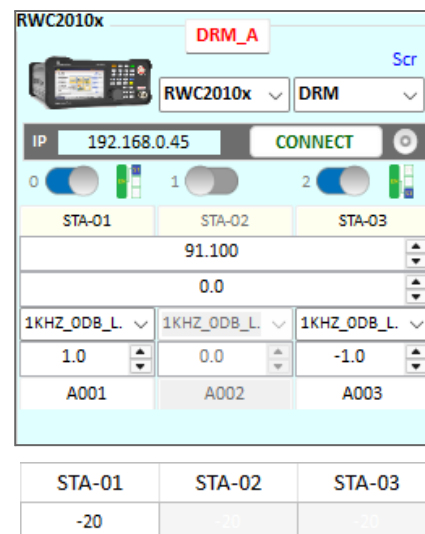
In the case of the RWC2100F, 3 different power sources can be set when all 3 transmitters are enabled, even optionally setting the transmit power to OFF respectively. Figure 3.24.d



The screenshot shows the RWC2010x interface in DAB_A mode. It includes a header with the device name, a mode selector set to DAB, and an IP address of 192.168.0.45. Below this are three service status indicators (0, 1, 2) and three service names (STA-01, STA-02, STA-03). The main area displays a frequency of 178.352 and a power level of 0.0. At the bottom, there are three 1KHZ_ODB_L sliders set to 1.0, 0.0, and -1.0, with corresponding labels A001, A002, and A003. A table at the very bottom shows the power levels for each station: STA-01 is -20, STA-02 is 0, and STA-03 is 0.

STA-01	STA-02	STA-03
-20	0	0

a. DAB mode power setup for RWC2010B/C



The screenshot shows the RWC2010x interface in DRM_A mode. It includes a header with the device name, a mode selector set to DRM, and an IP address of 192.168.0.45. Below this are three service status indicators (0, 1, 2) and three service names (STA-01, STA-02, STA-03). The main area displays a frequency of 91.100 and a power level of 0.0. At the bottom, there are three 1KHZ_ODB_L sliders set to 1.0, 0.0, and -1.0, with corresponding labels A001, A002, and A003. A table at the very bottom shows the power levels for each station: STA-01 is -20, STA-02 is 0, and STA-03 is 0.

STA-01	STA-02	STA-03
-20	0	0

b. DRM mode power setup for RWC2010B/C

RWC2010x FM_A

 RWC2010x Scr

IP: 192.168.0.45 CONNECT

0 ☒ 1 ☐ 2 ☒

STA-01	STA-02	STA-03
91.100	88.100	88.300
0.0		
1KHZ_ODB_L	1KHZ_ODB_L	1KHZ_ODB_L
1.0	0.0	-1.0
A001	A002	A003

STA-01	STA-02	STA-03
-20		

RWC2100F FM_A

 RWC2100F Scr

IP: 192.168.0.45 CONNECT

0 ☒ 1 ☐ 2 ☒

STA-01	STA-02	STA-03
91.100	88.100	88.300
0.0	0.0	0.0
1KHZ_ODB_L	1KHZ_ODB_L	1KHZ_ODB_L
1.0	0.0	-1.0
A001	A002	A003

STA-01	STA-02	STA-03
-20	-40	-70

c. FM mode power setup for RWC2010B/C d. FM mode power setup for RWC2100F
Figure 3.23 An example of power level setup according the equipment and mode

3.2.4 Running Power Profile Test

Clicking the  button on the Power profile tab will let the program run the profile sequence one by one. While running power profile, the current set power profile line is displayed in bold, and the car icon is animated in the power profile tab according to the time in seconds unit. The total elapsed time after [run] is displayed on the left side of the animation, and the remaining time and total test time is displayed on the right side, and the remaining time of the current power profile is displayed right next to the car icon.

current iter # /Maximum Iter #

Iter 1 / 3 00:00:12  #2[13] 00:01:03/00:01:15

Elapsed time  #Running profile index[Remaining time of current power profile] Remaining Time/ Total Estimated Time

Figure 3.24 Animating running time information during power profile test

3.2.4.1 Sending Parameter Commands

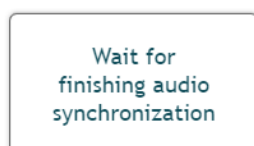
All parameter commands will be automatically sent to each unit immediately after clicking the [RUN] button. But if you want to set power level and parameters to each equipment, click the [SET] button in the power profile table that you want to set. While sending parameters commands, it will pop up a waiting message window.



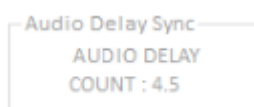
Figure 3.25 Message window for common

3.2.4.2 Audio Delay Synchronization

While running power profile, audio delay synchronization will be started after sending parameter commands. During synchronizing, a waiting message window will be popped up. It takes the total time which you set audio delay time for each station of each equipment.



a. Message for waiting audio delay synchronization



b. Audio delay count (in 100ms)

Figure 3.26 Message for waiting audio delay synchronization

Total audio delay synchronization time is the time difference between minimum and maximum audio delay values. This application software calculates the reset sequence, resets them one by one, and displays the current reset station in yellow during synchronization.

AUDIO DELAY(sec)	1.0	-3.0	-4.0	2.0	-2.0	-1.0	0.0	-1.0	6.0	7.0	0.0	7.0
Sequence	6	2	1	7	3	4	5	4	8	9	5	9

Figure 3.27 Audio delay synchronization sequence

3.2.4.3 Sending Power Commands

While running the power profile, power commands for each transmitter are automatically sent according to the power profile table and wait for a specified amount of time [Time Duration] before sending the next power profile.

3.2.4.4 Service Linking Test with Scriptor Activated

When transmitting script commands to multiple RWC equipment, the test application undergoes a synchronization process. Even if the script execution times vary across the devices, the application waits until all devices reach a ready state.

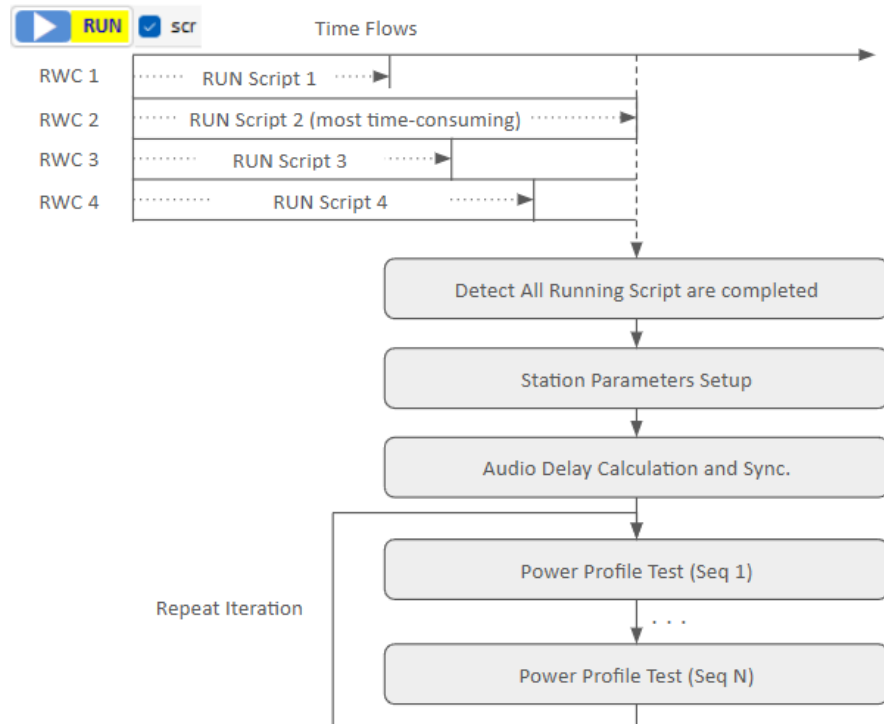


Figure 3.28 Service Linking Test Flowchart with Script Activated

Process Details

Step 1) Script Execution & Wait

Individual script commands are sent to each of the four devices. Because the scripts vary in length, their completion times will differ. However, the test application will not proceed to the next step; it waits until the command for the last remaining device is fully completed.

Step2) Station Setup

Once it is confirmed that all devices have completed their script executions, the test application sends the Station Setup commands simultaneously.

Step3) Audio Sync

After the station setup is complete, the application performs audio synchronization across the devices.

Step4) Power Profile Test

Once synchronization is finished, the Power Profile Test is executed repeatedly for the specified number of iterations.

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