TESCOM

TC-2300B DAB/DMB Tester

Operating Manual

R20190614

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PART 1. Get started

This chapter covers the instrumnet warranty, specifications, key features, and safety consideration.

1. General Information

1.1 WARRANTY

TESCOM warrants that this product is free from defects in terms of materials and workmanship for a period of one (1) year from the date of shipment. During the warranty period, TESCOM will -- at its discretion -- either repair or replace products that prove to be defective.

For the warranty service or repair, the Customer must notify TESCOM of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Customer shall be responsible for packaging and shipping the defective product to the service center designated by TESCOM. The Customer shall prepay the shipping charge to a TESCOM designated service center, and TESCOM shall pay the shipping charge to return the product to the Customer. In case the Customer is located outside of Korea, the Customer is responsible for all shipping charges including freight, taxes, and any other charge if the product is returned for service to TESCOM.

1.1.1 Limitation of warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate malignance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, accident, or abnormal conditions of operation.

TESCOM`s responsibility to repair or replace defective products is the sole and exclusive remedy provided to the Customer in case of breach of this warranty. TESCOM will not be liable for any indirect, special, incidental, or consequential damages regardless of whether TESCOM served advance notice of the possibility of such damages.

TESCOM

Product Service

EC-Attestation of Conformity
No.   E8 05 06 43088 006

Holder of Certificate: **Tescom Co., Ltd.**
927 Unitechvil, 1141-2
411-360 Baeksuk-Dong,Ilsan-Ku,Kyunggi
KOREA

Name of Object: **Industrial, Scientific and Medical equipment**
DAB/DMB Tester

This EC-Attestation of Conformity is issued according to the Directive 89/336/EEC relating to electromagnetic compatibility on a voluntary basis. It confirms that the listed equipment complies with the principal protection requirements of the EMC directive and applies only to the sample and its technical documentation submitted to TÜV Product Service GmbH for testing and certification. See also notes overleaf.

Test report no.:   E055R-072, E055R-073

Date,   2005-06-07

CE After preparation of the necessary technical documentation as well as the conformity declaration the required CE marking can be affixed on the product. Other relevant directives have to be observed.

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TESCOM

EC-Attestation of Conformity

No.   N8 05 06 43088 007

Holder of Certificate: **Tescom Co., Ltd.**
#927 Unitechvil, 1141-2 Baekseok-dong
411-360 Ilsan-gu, Goyang-si, Gyeonggi-do
KOREA

Product: **Electrical equipment acc. to the Low
Voltage Directive
(DAB/DMB Tester)**

This EC-Attestation of Conformity is issued on a voluntary basis according to the Low Voltage
Directive 73/23/EEC relating to electrical equipment designed for use within certain voltage
limits. It confirms that the listed equipment complies with the principal protection requirements of
the directive. It refers only to the particular sample submitted for testing and certification. See
also notes overleaf.

Test report no.:   CPSA0116265

Date,   2005-06-08

After preparation of the necessary technical documentation as well as the conformity
declaration the required CE marking can be affixed on the product. Other relevant
directives have to be observed.

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TÜV Product Service GmbH · TÜV SÜD Gruppe · Zertifizierstelle · Ridlerstrasse 65 · 80339 München · Germany

1.2 Safety Consideration

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 the Appropriate 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 voltage beyond the specified range to a terminal.

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, providing a separate grounding path to the instrument is recommended by connecting wire between the instrument ground terminal and earth ground to avoid electric shock or instrument damage. Before making connections to the input or output terminals of the product, make sure that the product is properly grounded.

Do Not Operate Without Covers

To avoid electric shock or product damage, do not operate this product with the 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 Other than that Specified by the Manufacturer

1.2.2 Product Damage Precautions

Use Appropriate Power Source

Do not operate this product using a power source that applies more than the specified voltage. 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 in case of Suspected Failures

If you think 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 considerable vibration, direct sunlight, outdoors, and where the ground is not level. Likewise, do not use it where the ambient temperature is beyond the range of 5 ℃ ~ 40 ℃.

1.2.3 Safety Symbols and Terms

1. These terms may appear in this manual.

WARNING

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

CAUTION

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

2. Symbols on the Product

The following symbols may appear on the product:

Power ON	Power OFF	WARRING / CAUTION	Indicates earth(ground) terminal

1.3 TESCOM Sales and Service Office

If you have difficulty with the product, call or write to our Technical Support specialists at:

NOTICE

TESCOM Company Limited

927 Unitechvil, 142, Ilsan-ro, Ilsandong-gu, Goyang-si, Gyunggi-do, Korea [ZIP 410-722]

TEL.: 82-31-920-6600

FAX: 82-31-920-6607

Email: tescom-sales@tescom.org

http://www.tescom.co.kr

1.4 Introduction

The TC-2300B DAB/DMB Tester combines all the test features required for DAB/DMB testing within a single unit, designed for manufacturing, R&D, QA and service center applications. The instrument is lightweight, portable and may be operated for all standard AC supplies.

The TC-2300B DAB/DMB tester supports not only Eureka-147 protocol encoder but also contains the function of RF up-converter which supports Band-Ⅱ, Band-Ⅲ, and Band-L with output power control from 0dBm to -120dBm in 0.1dB resolution.

In addition to complete DAB/DMB testing applications, the TC-2300B has an Audio Analyzer function for testing audio signal from DUT speaker or earphone jack. The TC-2300B supports I-Q out port for selectivity test with I-Q SG. The TC-2300B provides an ideal solution for many practical applications.

1.5 Key Features

- OFDM modulator, RF Up Converter, and Ensemble Multiplexer Combination Tester
- Support BAND Ⅱ, Ⅲ, L (87.5 MHz ~ 108 MHz, 174 MHz ~ 250 MHz, 1452 MHz ~ 1492 MHz)
- 0 dBm ~ -120 dBm RF Output
- Support I-Q out port (TC-2300B only)
- Built-in 2 Gbyte Flash memory to store Video or Audio stream data(up to 1072 Kbps)
- Built-in Audio Analyzer (SINAD, Distortion, Frequency, Level)
- Audio discontinuation test function for measuring digital audio quality
- Support FM modulation (FM Radio Test)
- Functional Test (Reconfiguration, Announcement, TII)
- Easy Program update (Flash type program Memory)
- High speed external data port to support external Audio or Video up to 600Kbps
- User definable screen (Useful for Manufacturing and R&D)
- GPIB and RS232C Remote Control port
- CE Compliant : EN 61010-1:2001, EN 61326:1997+A1:1998+A2:2001+A3:2003, EN 61000-3-2:2000, EN 61000-3-3:1995+A1:2001

1.6 Specification

> **⚠ CAUTION**
> INCLUDE_ERROR(ELEMENT_REMOVED)

> **⚠ CAUTION**
> INCLUDE_ERROR(ELEMENT_REMOVED)

1.7 Connectors

This section contains reference information for TC-2300B's connectors.

Table 1-1   TC-2300B Connectors

Connector	Specification
RS232C	Working Voltage: 100 V Dielectric Withstanding Voltage: 300 V
N Type Connector	Impedance: 50 ohm Voltage Rating: 250 Vpeak Dielectric Withstanding Voltage: 750 Vrms
BNC Connector	Impedance: 50 ohm Voltage: ±1 Vpk

2. Installation

2.1 Initial Inspection

This section provides information for verifying proper shipment of the TC-2300B DAB/DMB Tester.

Product Condition and Accessory Check

1. Upon receipt of the TC-2300B DAB/DMB Tester, check for damage that could have occurred during shipment.

2. Check whether you have received all the standard accessories supplied with TC-2300B as listed in table below.

Table 2-1   TC-2300B Accessory List

NO.	Part Number	Name	Specification	Q'ty
1	3407-0004	Adaptor	N(m) to BNC(f)	1
2	3806-0002	PC Application program	CD	1
3	4003-0044A	Cable	USB to RS-232C, 2 m	1
4	4006-0004	RF Cable	RG400S, N(m) to N(m), 1 m	1
5	4007-0001	RF Cable	RG58, BNC(m) to BNC(m), 1 m	4
6	TC-92080A	Antenna	Helical, 174 ~ 250 MHz	1
7	C2300B-9001	Operating Manual	CD	1
8		Power Cord	2 m	1

⚠ **CAUTION**

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to the equipment.

2.2 Power Requirement

This Tester is a portable instrument and requires no physical installation other than connection to a power source.

Characteristic	Requirement
Input voltage	100 - 240 VAC
Frequency	50 ~ 60 Hz
Power Consumption	Less than 40 watt.

⚠ CAUTION

If AC power is beyond the range of operation, the equipment may malfunction or sustain permanent damage. Main supply voltage fluctuations should not exceed 10% of the nominal voltage.

2.3 Operating Environment

Avoid locations with severe vibration, explosive danger, and direct sunlight. Store the product in a place at 5 ˚C ~ 40 ˚C with humidity of less than 85%.

When the product is not used for a long time, safely pack the product and store the packed product in a dry place at room temperature.

2.4 Carrying Handle and Caution for Moving

To adjust the handle position, push both caps covering the rotary joints on each side.

Then, rotate the handle to the desired position.
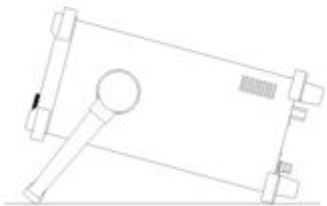
Bench-top viewing position
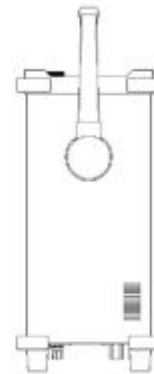
Carrying position

2.5 Cleaning and Shipment

2.5.1 Cleaning

Periodically wipe the case with a damp cloth mild detergent; do not use abrasives or solvents.

Keep the power supply free of dust. Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.

Clean the input terminal as follows:

1. Turn the TC-2300B off and remove all test leads.
2. Shake out any dirt that is in the terminals.
3. Soak a new swab with alcohol and work around in each terminal.

2.5.2 Shipment

When shipping this equipment, use the original packing materials. If they are not available, pack the equipment as follows:

Wrap this equipment, in appropriate shock absorbing materials and put it in a corrugated cardboard box at least 5 mm thick. (If shipping to a TESCOM Service Office, attach a tag indicating the type of service required; return address, model number and full serial number.)

Wrap its accessories separately in the same shock absorbing material and put them in the same corrugated cardboard box together with this equipment.

Fasten the corrugated cardboard box with packing strings.

Mark the shipping container FRAGILE to assume careful handing.

> ⚠ **CAUTION**
>
> Never use any chemical cleaner other than alcohol for the maintenance of this equipment. Organic solvent such as benzene, toluene or acetone may spoil the plastic parts of this equipment

3. Firmware update

For upgrading, TC-2300B Application Program shall be used. The program is provided together with the product and it is available to download the update data from TESCOM Website or provide it via email

3.1 TC-2300B and a PC connection

1. Connect the the **VIDEO/AUDIO** port on the rear side of TC-2300B and the USB port of the PC using the provided USB to RS232C cable.

USB to RS232 Cable

⚠ **CAUTION**

Do confirm specifications of a USB to RS-232C cable if it is not the one provided from TESCOM by the time product released.

* Maximum Speed: 921.6 kbps
* Connector: DE-09P (DB-9 Male)

3.2 USB Driver Istallation

USB-to-serial cable is used for communication. Therefore, upon the installation of the driver, a COM port will be configured on t he PC.

USB driver may be downloaded by accessing the TC-2300B product CD or TESCOM website.

1. Confirming the COM port number
    A. Open the "Device Manager" to confirm which COM port number is assigned for connection with the device.
    B. Click "Ports (COM & LPT)" to extend it, then you can find "USB Serial Port".The "COMxx" number is different depending on your PC.
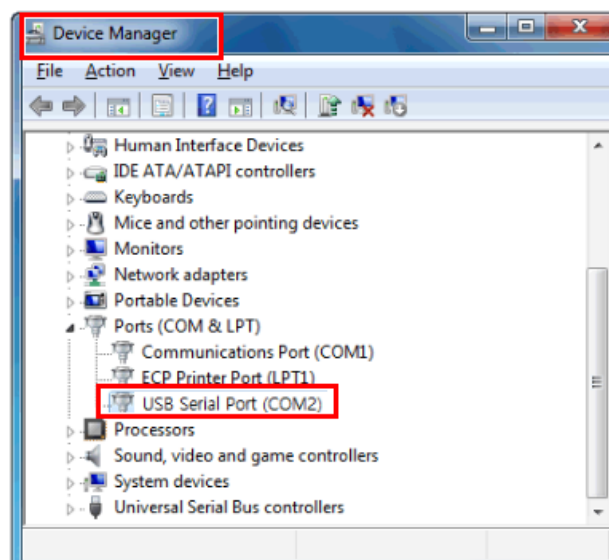
3.3 TC-2300B Firmware update Sequence

1. Find "DOWNLOAD" switch of TC-2300B rear panel to be DOWNLOAD position. Then, turn on TC-2300B
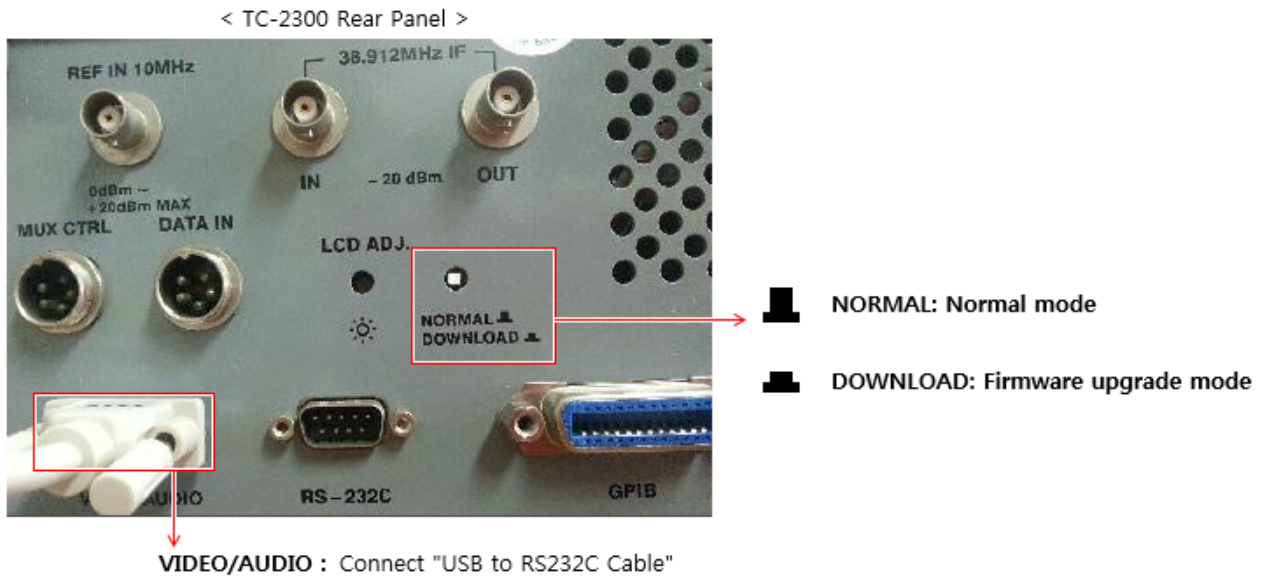
Figure 3-1 TC-2300B Set up for Firmware update

2. Run the TC-2300 Application Program on the PC
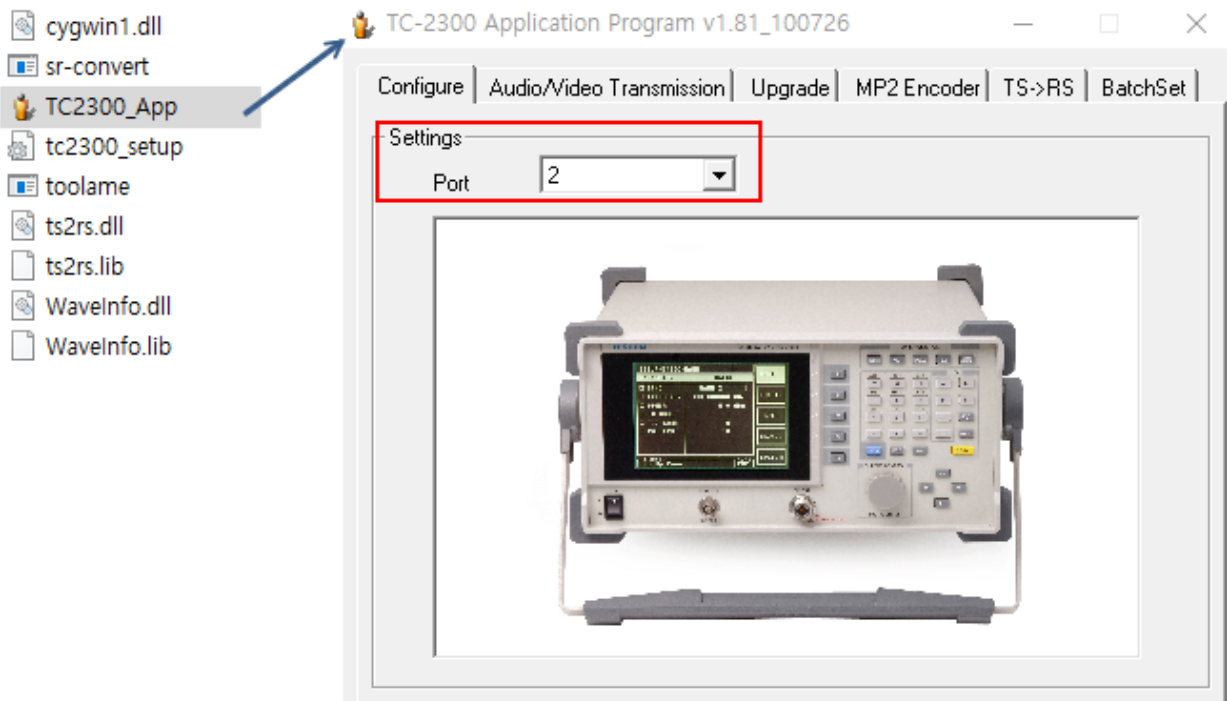
3. Select Firmware Upgrade Tab and click "Open" button to select Firmware Data File. Click "Transfer"

button to start Upgrade. The update proceeding status shall be displayed on the bar below.

NOTICE

Firmware update file type of TC-2300B is "TC2300_VXXXX.DAT"

---
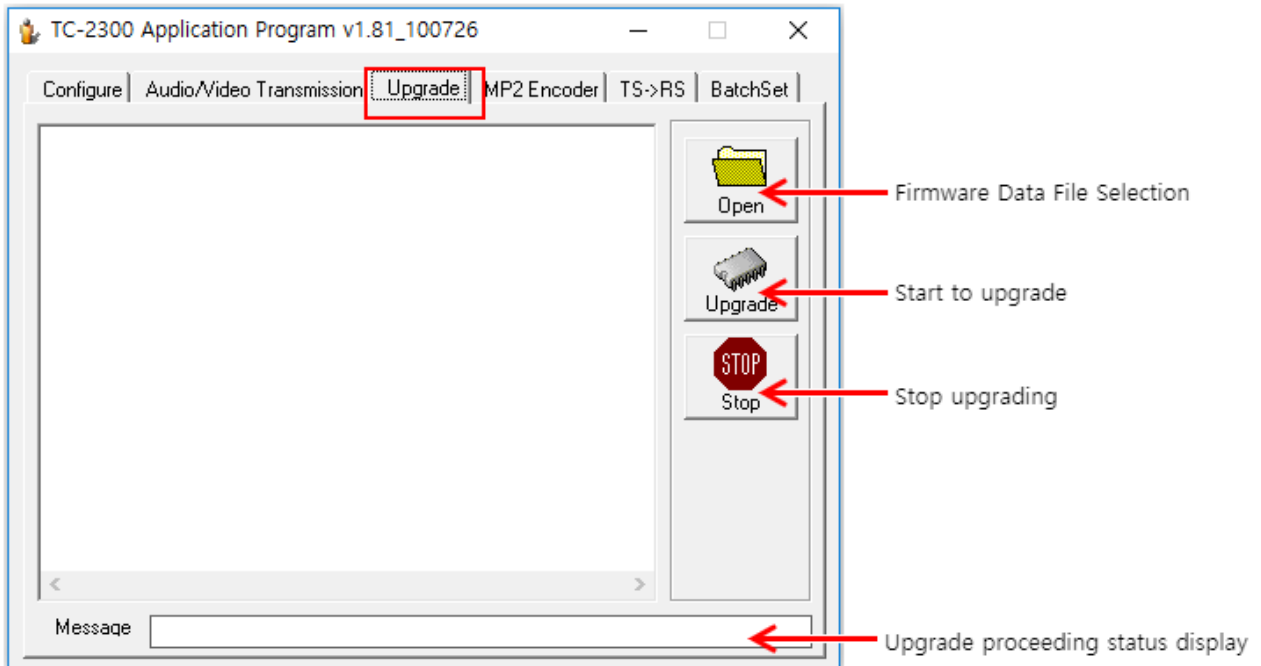
4. During the update, the progress shall be displayed on the TC-2300B GUI screen.
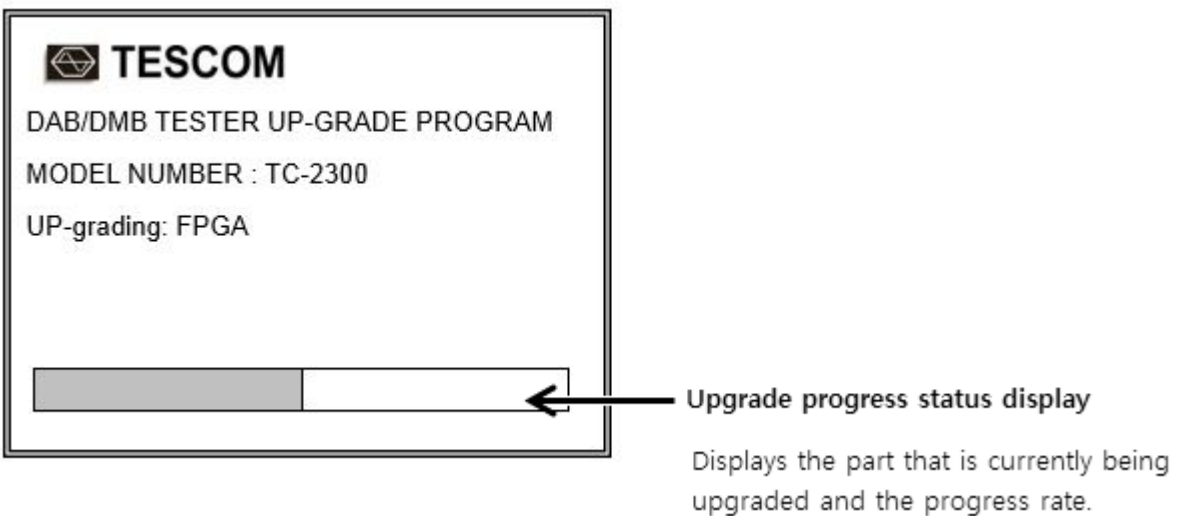
5. Once downloading is completed, turn off TC-2300B and disconnect the cable. Afterward, change "DOWNLOAD" switch to the NORMAL position, turn on TC-2300B. The new firmware version and date will be displayed on the start screen.

> ⚠ **CAUTION**
>
> If downloading fails, restart TC-2300B and repeat the downloading sequence from the beginning.

PART 2. Operation
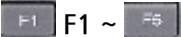
This section describes the basic concepts and details of operating TC-2300B DAB/DMB Tester. Understanding the basic concepts of your TC-2300B helps you use it effectively. Operation Overview quickly shows you how TC-2300B is organized and gives some very general operating instructions. After you read Operating Overview you can use Operation Procedure for detail information.

4. Basic Operation

4.1 Front Panel View

Figure 4-1　TC-2300B Front Panel

❶ LCD display.

❷ ▢ **F1** ~ ▢ **F5** : Soft key (Hot key)

❸ ▢ **Setup** : Basic Setup screen selection such as channel(frequency), output level

❹ ▢ **MCI** : Ensemble configuration parameter screen selection

❺ ▢ **SI**: Reconfiguration, Announcement, TII (Transmitter Identification Information), Time related parameter setting

❻ ▢ **TESTS** : Audio analyzer, FM signal generator, Audio test parameter setting, Audio test P/F (Pass or Fail) judgment screen selection

❼ ▢ **USER MENU** : Frequently used menu screen

❽ ▢ **INPUT TYPE** : Character input mode(UP, LOW, NUM), Channel Table Type setting

❾ ▢ **Recall** : Call for stored settings

❿ ▢ **ENTER** : Data input, input mode switching

⑪ : Cursor move and data value change

⑫ ▢ : Back Space

⑬ ▢ **ESC** : Input cancel, Popup window release, Return to the previous state

⑭ **Rotary knob**: Cursor move, same as **ENT** function, value change at data input mode

⑮ ▢ **FCN** : used for selecting the secondary function of each key

⑯ RF connector

⑰ Audio signal input connector

⑱ Power switch

4.1.1 Soft Key (F1 ~ F5 Key)

Soft keys allow you to instantly access and alter instrument settings without using the Rotary knob. You can use Soft keys to move quickly between submenus on the same main screen.

When Soft key is pressed, the cursor instantly moves to the related submenu. Five Soft keys are available for each main screen: [F1] F1 ~ [F5] F5

4.1.2 Rotary Knob

The Rotary Knob moves the cursor to every field on the screen that can be changed. By positioning the cursor in front of a field and pushing the knob to select that field, you can alter that field's setting.

> ⚠ **CAUTION**
>
> Make sure the knob clicks into proper position, otherwise the keyboard might not function correctly.

4.1.3 FCN Key

Selection of Secondary function (Blue label, used with FCN key ([FCN])

> 💡
> * [FCN] (FCN) + [Recall] (Recall) = Store the current instrument settings into memory
> * [FCN] (FCN) + [USER MENU] (USER MENU) = Frequently used menu registration

4.2 Rear Panel View

Figure 4-2 TC-2300B Rear Panel

❶ **MUX CTRL** : Distributor control

❷ **REF IN 10 MHz** : External reference oscillator input

❸ **DATA IN** : Interface for BER measurement

❹ **38.912 MHz IF IN** : IF input / ❼ **38.912 MHz IF OUT** : IF output

❺ **LCD ADJ** : LCD brightness adjustment switch

❻ **NORMAL/DOWNLOAD** : Firmware update / Data download switch

❽ **I-OUT** : In-phase out / ❾ **Q-OUT** : Quadrature out

❿ **VIDEO/AUDIO** : Video (RS data) or Audio data input, F/W update

⓫ **RS-232C** : RS232C interface.

⓬ **GPIB** : GPIB interface

⓭ Power input

4.2.1 Display Contrast Adjustment

To adjust the contrast of LCD display, turn the control switch written as "LCD ADJ." of the rear panel. Turn it to optimize the display for viewing it from straight on. If the display is blank, first attempt to adjust the display contrast adjustment before returning the instrument for service.

4.3 GUI

4.3.1 Start-up Screen

If "LINE" switch of front panel is "ON", the power will be supplied. If switch ON, the initial screen appears as below and the model name and version etc. are displayed. 10 seconds later, the Setup screen will be displayed.

> **NOTICE**
>
> When TC-2300B is turned on, the instrument does not return to the power-off condition but recalls the settings from the most recently saved memory location (STORE Number).

4.3.2 Display Screen

Current Position Display:
Display the currently selected menu position.

User Menu Setting:
If the frequently used parameters become Check condition by using FCN + USER MENU key, they are registered on the User Menu Screen

On Air Indicator:
When transmitting DAB/DMB signal, the bar moves.
In SG mode, it is not displayed.

SETUP \ BASIC \ FREQ (BAND 3)

PARAMETER . . .	VALUE . . .
BAND	BAND_3
CHANNEL	5A
FREQUENCY	164.280000 MHz
POWER	−120.0 dBm
P_STEP	0.5 dB
PATH LOSS	0.0 dB
RF OUT	ON

165MHz ~ 250MHz   P F FLT

BASIC

CONFIG

FILE

Submenu:
Press using F1 ~ F2 keys to switch into the screen related to each key.

External Source Transmission State:
When setting the source of service component as "External" and receiving the file from external PC, this displays the state.

N: No Connection, No Use
P: Pass, Transmission successfully
F: Fail, Transmission in failure

FCN key verification:
Press FCN key to turn over.

Input type:
Displays the input type of the currently selected parameter.

FLT: Floating
HEX: Hexadecimal,
DEC: Decimal,
UP: Capital Letter
LOW: Small Letter
NUM: Number
POP: Pop-up Menu
TOG: Toggle Menu
EU: Channel Config for EU format
KOR: Channel Config for KOR format
CA: Channel Config for CA format
CN: Channel Config for CN format

Input Range :
Displays the input range of the currently selected field.

4.3.3 Data Input and Change

1. Move cursor to the desired input field using Rotary Knob or arrow keys.
2. Push Rotary Knob or ENTER ENT key for data input mode. The cursor indicates data input position. If there are only two alternatives, push the rotary knob to toggle the data.
3. While entering the data, if you press ESC ESC or ← key, the input data shall be cancelled or edited.
4. Change value with Rotary Knob or arrow keys. Or enter data with Key Pad.
5. Push Rotary Knob to enter data and then the new data is entered.
6. ESC ESC or ← key can be used if necessary during key pad entry.
7. One of many fields displays a list of choices when selected. Select a new setting from the list

4.4 Menu Structure
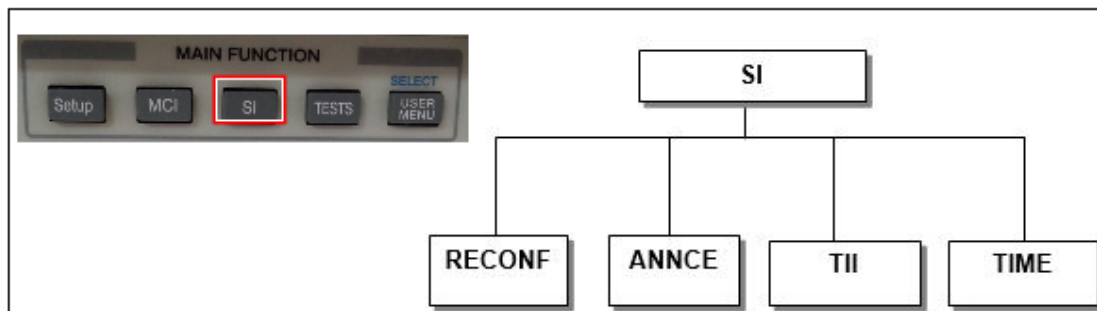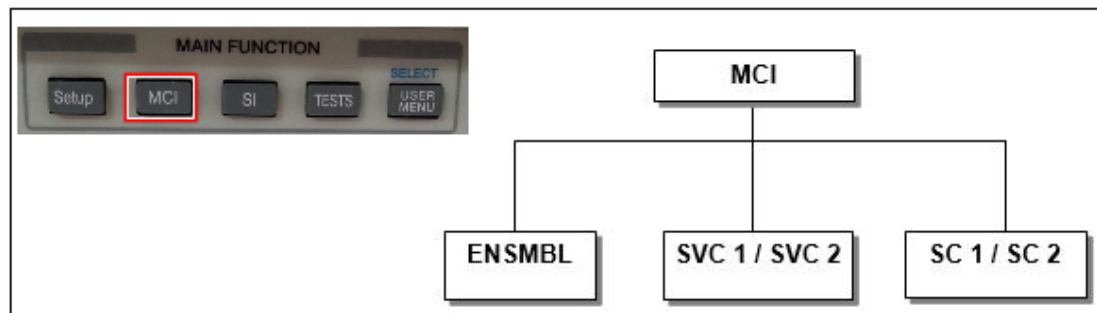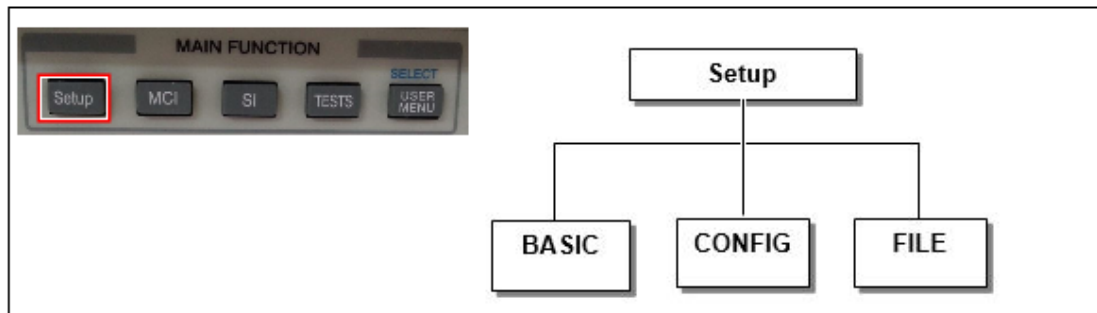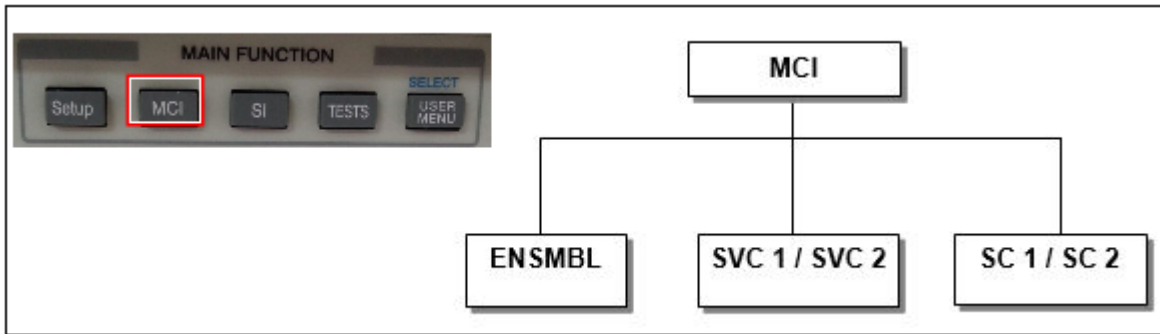
4.5 Main Function Selection

TC-2300B DAB/DMB Tester has a tree-type menu structure, and each major parameter setting screen can be selected by pressing Main Function keys. The following shows the description of each test screen and key

Table 4-1   Main Function Selection

Major Screen	Description	Hot Key
Setup	Set the frequency band, channel, and output of the signal.	Setup
MCI (Multiplex Configuration Information)	Set or change protocol-related parameters.	MCI
SI (Service Information)	Check the product firmware version and the serial number.	SI
TESTS	In case of Audio test by Audio Analyzer, change of parameter related to audio test, or simultaneous test of several DUTs by Distributor, it is available to do P/F (Pass or Fail) judgment screen view etc. Available to use it as general Signal Generator by using SG mode.	TESTS
USER MENU	Pre-registered frequently used menu view	USER MENU

4.5.1 Setup

This screen is to set the frequency of sending signal and output level etc. and shall be switched by pressing the [Setup] **Setup** key.

4.5.1.1 Basic(Setup → F3)

Parameter	Input Range	Default	Description
BAND	Band 2, Band 3 Band L	Band 3	To set the Frequency Band.
CHANNEL	5A ~ 13F	5A	Sending channel selection. If you select CHANNEL, the frequency shall be changed automatically suitable for the channel. If selected Band 2, this menu shall not be displayed. For Band 3, basically set in Korea Table. To change it with Europe Table or China Table, press [INPUT TYPE] **INPUT TYPE** key. For Band L, available to select Europe Table and CANADA Table.
FREQUENCY	Band 2 : 87.5 MHz ~108 MHz Band 3 : 165 MHz ~ 250 MHz Band L : 1452 MHz ~ 1492 MHz	205.280 MHz	To set the signal frequency
POWER	(-120 dBm-Path Loss) ~ (0 dBm-Path Loss)	0 dBm	To set the output power
PWR_STEP	0.1 ~ 100.0 dB	1	In case of POWER setting, the step of increase or decrease when pressing ↑ or ↓ key one time.
PATH LOSS	0 ~ 50 dB	0 dB	To enter Path Loss value from TC-2300B to DUT. If Path Loss value is entered, TC-2300B outputs the signal as much as [the setting Power + Path Loss] so that the receiver can receive the value set in [Power].
RF OUT	ON, OFF	ON	To determine RF output ON / OFF

NOTICE

If setting **PATH LOSS,** TC-2300B outputs the signal actually as much as [the setting Power + Path Loss]. However, as max. output power of TC-2300B is 0 dbm, when entering **POWER** or **PATH LOSS** value, the sum of two values should not be exceeded to 0 dBm.

4.5.1.2 Configuration(Setup → F2)

To set IF I/O, remote control related to the system, press [F2] **F2** to switch into **[CONFIG]** menu screen.

Parameter	Input Range	Default	Description
IF OUT	ENABLE, DISABLE	DISABLE	To select if using IF output port or not
EXT IF IN	DISABLE, OFDM, CW	DISABLE	To select if receiving the external IF input or not
RMT CTRL	GPIB, RS232C	GPIB	To select remote control port.
GPIB ADDR	0 ~ 30	10	To set GPIB address. Displays when RMT CTRL is GPIB.
GPIB NRFD	USE, NONE	USE	GPIB NRFD
BPS	600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400	19200	To set RS232C configuration. Displays when RMT CTRL is RS232C.
DATA BITS	5-bit, 6-bit, 7-bit, 8-bit	8-bit	To set RS232C configuration. Displays when RMT CTRL is RS232C.
PARITY	off, Even, odd	off	To set RS232C configuration. Displays when RMT CTRL is RS232C.
STOP BIT	1-bit, 2-bit	1-bit	To set RS232C configuration. Displays when RMT CTRL is RS232C.

NOTICE

If **IF OUT** is **ENABLE**, it is not available to output RF signal and **RF OUT** will be **OFF** in the **[Basic]** screen. In order to turn **ON RF OUT** again, **IF OUT** must be set **DISABLE**. IF **IFOUT** is **ENABLE**, it is not available to change **RF OUT** mode.

4.5.1.3 FILE(Setup → F3)

To store moving picture or audio file in TC-2300B internal memory or check the state, press `F3` **F3** to switch into **[FILE]** menu.

Parameter	Input Range	Default	Description
TYPE	VIDEO1, VIDEO2, VIDEO3 AUDIO1, AUDIO2, AUDIO3	VIDEO 1	To select the file type and position to save in internal memory
MEMO			To input memo of the stored file
DOWNLOAD	ON, OFF	OFF	Download mode ON/OFF, If download is ON, not available to output RF signal.
SIZE			To display the size of the currently saved file according to the type and while downloading, display the download size.
SENDING			To display the file transmission amount from TC-2300B at real time when selecting SOURCE by MEMORY at service component.
RESTART			To transmit the file again from the start.

NOTICE

  1) DAB/DMB Source file

   • For moving picture file, you should use the one that RS Coding and Convolution Interleaving are completed.

   • For audio file, you should use MP2 formatted one.

  2) DAB+ Test

For DAB+ audio file, you should use "AAC v2 source" that audio super framing and RS coding and virtual interleaving are completed.

  3) ETI Test

For ETI file, you should use ETI(NI,G.703) formatted one.

  4) Max. storage capacity of moving picture and audio file is below, respectively.

   • VIDEO1: 230 M ---- AUDIO1: 30 M

   • VIDEO2: 100 M ---- AUDIO2: 30 M

   • VIDEO3: 1500 M --- AUDIO3: 30 M

  5) If DOWNLOAD is ON, the signal transmission stops and it is not available to change other parameters.

  6) If file downloading starts, the existing file shall be deleted automatically.

  7) For file download, you should use TC-2300B Application program, and for further information, please refer to "Application Program Setup and Operation" and "DAB/DMB signal transmission by TC-2300B".

4.5.2 MCI(Multiplex Configuration Information)

Ensemble Configuration

As TC-2300B has one Ensemble that corresponds completely with Eureka-147 Protocol, the user can modify the related parameter freely. Ensemble configuration has two services as shown below and consists of 6 fixed service component and 2 service component to modify parameters. Service1 and Service 2 enable to configure the various types of ensemble by connecting 10 service components with Primary and Secondary.
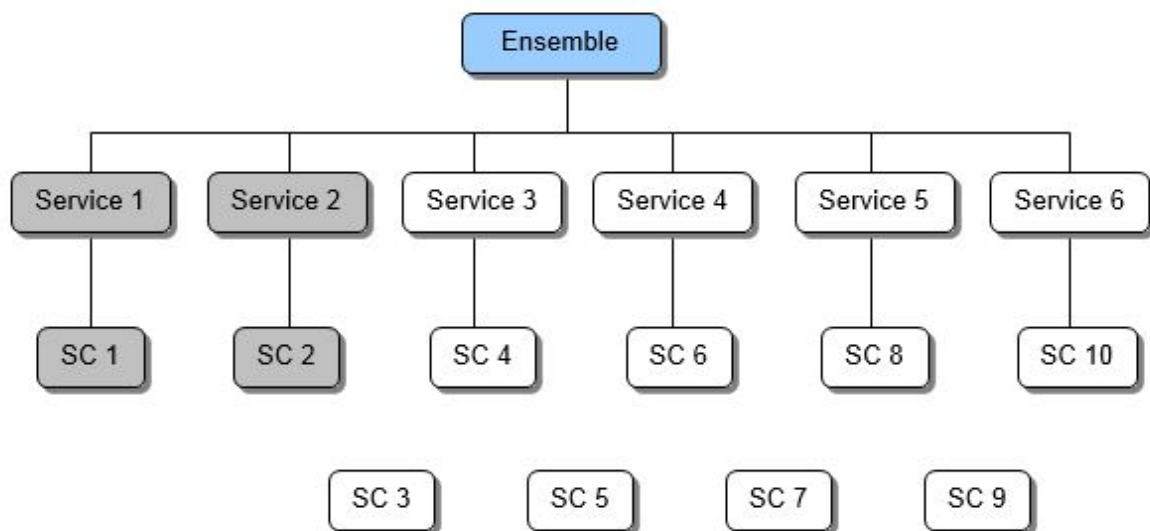
NOTICE

1. Bit Rate setting: In case of setting Data Rate (**BIT RATE**), it is required to consider the transmission bandwidth defined in Eureka-147 Protocol. For TC-2300B, if the calculated value of Service Component for Error Protection Level and Bit Rate exceeds the broadband width, Bit Rate is not allowed to input. In this case, adjust the broadband width of the remaining Service Component adequately low and enter Bit Rate again.

2. Check if Bit Rate corresponds with the value of sending data. If not, the receiver may not demonstrate the audio or moving picture.

3. It is not available to set **SOURCE** of SC1 and SC2 by EXTERNAL at the same time.

4. SOURCE and **PROTECT** are changed automatically as below, if you change the TYPE of SC1,SC2

	AUDIO	DATA
SOURCE	INTERNAL	INTERNAL
PROTECT	UEP	EEP

4.5.2.1 ENSBLE(MCI → F1)

Parameter	Input Range	Default	Description
ETI	ON, OFF	OFF	ETI ON/OFF
TX MODE	1 ~ 4	1	Transmission Mode setting
REFERENCE	0 ~ 1,048,575	0	Reference No. input
COUNTRY	0 ~ 15	eH	Country code setting
ECC	0 ~ 255	f1H	Extended Country Code
LABEL	Max.alphabet 16 letters	TESCOM	Ensemble label input
CHAR FLAG	0x0 ~ 0xFFFF	ff00H	Ensemble Label Character Flag
CHAR SET	0x0 ~ 0xF	0H	Ensemble Label Character set
SVC1 ~ SVC2	ON, OFF	ON	Service ON/OFF

4.5.2.2 SVC 1 / SVC 2(MCI → F2 or MCI → F3)

Parameter	Input Range	Default	Description
REFERENCE	0 ~ 1,048,575	0	Service Reference No. SVC1과 SVC2를 같은 값으로 설정불가
SC1	OFF, PRIMARY, SECOND	PRIMARY (SVC2-OFF)	To fix Service Component connection
SC2	OFF, PRIMARY, SECOND	OFF (SVC2-PRIMARY)	To fix Service Component connection
SC3 ~ SC10	OFF, PRIMARY, SECOND	OFF	To fix Service Component connection
LABEL	Alphabet 16 letters	SERVICE 1	Service label input
CHAR FLAG	0x0 ~ 0xFFFF	ff00H	Service Label Character Flag
CHAR SET	0x0 ~ 0xF	0H	Service Label Character Set
PRG. TYPE		None	Program type (traffic, news, education….)

TYPE Default of [SC1] - DATA

TYPE Default of [SC2], [SC3~SC10] - AUDIO

4.5.2.3 SC 1/2 : DATA TYPE(MCI → F4 or MCI → F5)

Parameter	Input Range	Default	Description
SC1/2 TYPE	AUDIO,DATA, PACKET	DATA	Select Service Component type among audio, data(video) or packet
SC1/2_Data	INTERNAL, EXTERNAL, VIDEO 1~3	VIDEO 3	To set if audio source is Internal, Internal Memory or External input.
SC1/2_Ptype	UEP (Unequal Error Protection), EEP (Equal Error Protection)	EEP	Error Protection type selection. Protection level depends on the type selection.
SC1/2eep_Lv SC1/2uep_Lv	UEP : 1 ~ 5 EEP : 1~4-A, 1~4-B	3-A	Protection Level setting
SC1/2eepBPS SC1/2uepBPS	8 ~ 1072	544	Data transmission speed setting. The range and basic setting value depends on PROTECT type. In case of audio, the parameter is not displayed because the Bit Rate is set automatically.
PATTERN	10101010 11110000 11111111 00000000 RS_ALL_0 RS_ALL_1	10101010	To select the type of data to be transmitted. The menu displays only in case of setting Source by Internal. In case of 'RS_ALL_0' pattern, the MPEG-TS packet which composed by 187 data bytes(all 0) and sync byte (0x47) will be transmitted to RS encoder and convolutional interleaver.
LABEL	English 16 Character	Service comp. 1	Service Component label input
CHAR FLAG	0h ~ FF00h	ff00H	Character Flag of Service Component
CHAR SET	0h ~ Fh	0H	Character set of Service Component
LANGUAGE	0 ~ 255	9	Service Component Language input
SubChId	0 ~ 54, 63	01	Set of Sub-Channel Identifier
DSCTY	0 ~ 63	24	Data Service Component Type setting. Set up 24 in Korea DMB.
AppType	0 ~ 2047	9	Packet mode Application type setting
AppData	0 ~ 255	1	Packet mode Application data setting
CA_FLAG	ON/OFF	OFF	Conditional access flag setting for CAS test

4.5.2.4 SC 1/2 : AUDIO TYPE(MCI → F4 or MCI → F5)

Parameter	Input Range	Default	Description
SC1/2 TYPE	AUDIO, DATA, PACKET	AUDIO	Select Service Component type among audio, data(video) or packet

Parameter	Input Range	Default	Description
SC1/2_Audio	INTERNAL, EXTERNAL, AUDIO 1~3	AUDIO3	To set if audio source is Internal, Internal Memory or External input.
SC1/2_Ptype	UEP, EEP	UEP	Error Protection type selection. Protection Level depends on type selection.
SC1/2eep_Lv SC1/2uep_Lv	UEP : 1 ~ 5 EEP : 1~4-A, 1~4-B	3	Protection Level setting
SC1/2eepBPS SC1/2uepBPS	32 KBPS, 48 KBPS, 56 KBPS, 64 KBPS, 80 KBPS, 96 KBPS, 112 KBPS, 128 KBPS, 160 KBPS, 192 KBPS, 224 KBPS, 256 KBPS, 320 KBPS, 384 KBPS	192KBPS	Data transmission speed setting. The range and basic setting value depends on PROTECT type.
VERSION	MPEG-1, MPEG-2 DAB+	MPEG-1	Audio codec version setting
MODE	STEREO, JOINT, DUAL, MONO	STEREO	Audio mode setting. The menu displays only in case of setting Source by Internal.
FREQ R	0 ~24000 Hz (125 Hz step)	1000 Hz	Audio frequency setting. The menu displays only in case of setting Source by Internal. The right side of audio frequency
LEVEL R	3 dBm0 ~ - 70 dBm0	3 dBm0	Audio Level setting. The menu displays only in case of setting Source by internal. The right side of audio level
FREQ L	0 ~ 24000 Hz (125 Hz step)	1000 Hz	Audio frequency setting. The menu displays only in case of setting Source by Internal. The left side of audio frequency
LEVEL L	3 dBm0 ~ -70 dBm0	3 dBm0	Audio Level setting. The menu displays only in case of setting Source by internal. The left side of audio level
DLS_ON	ON, OFF	ON	Internal DLS mode ON/OFF
DLS	MAX. 128 characters	Dynamic Label Test	PAD (Program Associated Data) input, max. 128 letters
DLS SET	0h ~ Fh	0H	DLS Character Set type input
LABEL	English 16 Characters	Service comp.2	Service Component label input
CHAR FLAG	0h ~ FF00h	ff00H	Character Flag of Service Component
CHAR SET	0h ~ Fh	0H	Character Set of Service Component
LANGUAGE	0 ~ 255	9	Service Component language input
SubChId	0 ~ 54, 63	1	Set of Sub-Channel Identifier
ASCTY	0~63	0	Audio Service Component type input
CA_FLAG	ON/OFF	OFF	Conditional access flag setting for CAS test

4.5.2.5 SC 1/2 : PACKET TYPE(MCI → F4 or MCI → F5)

Parameter	Input Range	Default	Description
SC1/2 TYPE	AUDIO, DATA, PACKET	PACKET	Select Service Component type among audio, data(video) or packet
SOURCE	INTERNAL, EXTERNAL, AUDIO 1~3	INTERNAL	To set if audio source is Internal, Internal Memory or External input.
PROTECT	UEP, EEP	EEP	Error Protection type selection. Protection Level depends on type selection.
PRT LEVEL	UEP : 1 ~ 5 EEP : 1~4-A, 1~4-B	3-A	Protection Level setting
BIT RATE	32 KBPS, 48 KBPS, 56 KBPS, 64 KBPS, 80 KBPS, 96 KBPS, 112 KBPS, 128 KBPS, 160 KBPS, 192 KBPS, 224 KBPS, 256 KBPS, 320 KBPS, 384 KBPS	192KBPS	Data transmission speed setting. The range and basic setting value depends on PROTECT type.
PATTERN	10101010 11110000 11111111 00000000 RS_ALL_0 RS_ALL_1	10101010	To select the type of data to be transmitted. The menu displays only in case of setting Source by Internal. In case of 'RS_ALL_0' pattern, the MPEG-TS packet which composed by 187 data bytes(all 0) and sync byte (0x47) will be transmitted to RS encoder and convolutional interleaver.
LABEL	English 16 Characters	Service comp.2	Service Component label input
CHAR FLAG	0h ~ FF00h	ff00H	Character Flag of Service Component
CHAR SET	0h ~ Fh	0H	Character Set of Service Component
LANGUAGE	0 ~ 255	9	Service Component language input
SubChId	0 ~ 54, 63	1	Set of Sub-Channel Identifier
ADDRESS	1 ~ 1023	2	Packet mode Address setting
DG	ON, OFF	OFF	Data group flag ON/OFF
DSCTY	0 ~ 63	24	Data Service Component Type setting. Set up 24 in Korea DMB.
AppType	0 ~ 2047	9	Packet mode Application type setting
AppData	0 ~ 255	1	Packet mode Application Data setting
FEC	ON, OFF	OFF	Forward Error Correction ON/OFF setting
CA_FLAG	ON, OFF	OFF	Conditional access flag setting for CAS test

4.5.3 SI (Service Information)

Reconfiguration, Announcement, TII (Transmitter Identification Information), Time can be set in this screen Press [SI] SI key for selection.

4.5.3.1 Reconfiguration(SI → F1)

If Reconfiguration starts, MIC information for Ensemble configuration to be switched newly will be added to the transmitting signal, and transmitted together with the existing MCI information. After the setting time set in **INTERVAL,** the existing information shall not be transmitted while only the new information shall be transmitted. Reconfiguration is used when changing the structure of Ensemble at the Broadcasting Studio and the receiver should receive the signal without interrupting even if the structure of Ensemble has been changed while receiving in broadcast.

Press [F1] **F1** key to switch into **[Reconfiguration]** screen and enter the information of Ensemble structure to change and **INTERVAL** value. If **SWITCHING** is ON, Reconfiguration shall be executed. If **SWITCHING** is OFF again, the Ensemble information set in MCI originally shall be transmitted again.

NOTICE

If the receiver does not support Reconfiguration, it may not be possible to receive the signal in the receiver even if RECONFIG is ON

Parameter	Input Range	Default	Description
SWITCHING	ON, OFF	OFF	Reconfiguration ON / OFF
INTERVAL	Max. 6 second	62 FR	Interval Time setting for Reconfiguration. If Transmission Mode is I, 1 Frame is 96ms, max 6 seconds possible.
TYPE	SVC1, SVC2, SC1, SC2	SVC1	To set Reconfiguration Service and Service Component.
SC1	OFF, PRIMARY, SECOND	PRIMARY	Displays when TYPE is SVC1 or SVC2. To fix the Service Component connection.
SC2	OFF, PRIMARY, SECOND	OFF	Displays when TYPE is SVC1 or SVC2. To fix the Service Component connection.
SC3 ~ SC10	OFF, PRIMARY, SECOND	OFF	Displays when TYPE is SVC1 or SVC2. To fix the Service Component connection.
SC1/2data(R)	INTERNAL, EXTERNAL AUDIO 1/2/3, VIDEO 1/2/3		Displays when TYPE is SC1 or SC2. Select signal source.
Ptype(R)	UEP, EEP	EEP	Displays when TYPE is SC1 or SC2. Error Protection type selection.
eepLv(R)	UEP : 1 ~ 5	3-A	Displays when TYPE is SC1 or SC2.

Parameter	Input Range	Default	Description
uepLv(R)	EEP : 1~4-A, 1~4-B		Error Protection Level selection
eepBps(R) uepBps(R)	8 ~ 1072	544	Displays when TYPE is SC1 or SC2. Bit Rate setting
RESET			To change all parameters on Reconfiguration screen to the initial value.

4.5.3.2 Announcement(SI → F2)

Announcement function forces the receiver to change the Service Component automatically while receiving the broadcasting if necessary, and is used to announce the irregular information such as emergency alarm, breaking news, prompt traffic news, weather, event etc. regardless of the receiver selection. From the receiver side, it may provide the function to preset whether or not to receive from various Announcement information provided by the broadcasting station.

Press **F2** key to switch to **[Announcement]** screen and determine whether to support per type of each Announcement. If **SWITCHING** is ON, it shall be moved to Service Component set in SC.

From the setting of each type, ASU means Announcement Support Flag that this service is supported by the sending side (TC-2300B) whereas ASU ASW means ASU Switching that is transmitted actually when executing Announcement. That is, the receiver displays that Announcement Service set as ASU shall be supported before executing Announcement but if executing actually, the service set as ASU ASW shall be received in the corresponding Service Component automatically.

TC-2300B transmits the service information set as ASU additionally but if SWITCHING is ON, it transmits immediately Announcement Message set as ASU ASW to Service Component set in SC.

> ⚠ **CAUTION**
>
> If there is no Announcement Service set as ASU ASW or selecting from more than 2 Announcement Service,**SWITCHING** does not become ON.

Parameter	Input Range	Default	Description
SWITCHING	ON, OFF	OFF	Announcement start or stop
ASW	ALARM, TRAFFIC, TRAVEL, WARNING, NEWS, WEATHER, EVENT, SPECIAL, RAD_INFO, SPROTS, FINANCE	ALARM	Select Announcement Switching type
SC	SC1 ~ SC8	SC1	Service Component from which Announcement will come out
CLUSTER	1 ~ 255	1	Number of clusters
ALARM	ON, OFF	ON	Service support setting

Parameter	Input Range	Default	Description
TRAFFIC	ON, OFF	ON	Service support setting
TRAVEL	ON, OFF	ON	Service support setting
WARNING	ON, OFF	ON	Service support setting
NEWS	ON, OFF	ON	Service support setting
WEATHER	ON, OFF	ON	Service support setting
EVENT	ON, OFF	ON	Service support setting
SPECIAL	ON, OFF	ON	Service support setting
RAD_INFO	ON, OFF	ON	Service support setting
SPORTS	ON, OFF	ON	Service support setting
FINANCE	ON, OFF	ON	Service support setting

4.5.3.3 TII (Transmitter Identification Information)(SI → F3)

TII (Transmitter Identification Information) is used to transmit the information of a transmitting station such as a base station and if TII is ON, TII information shall be transmitted to the Null Symbol section.

Parameter	Input Range	Default	Description
TII	ON, OFF	OFF	TII setting ON / OFF
MAIN_ID	0 ~ 69	0	MAIN_ID
SUB_ID	0 ~ 23	0	SUB_ID

4.5.3.4 TIME(SI → F4)

In [TIME] screen, it is available to set the time displayed in the receiver. LTO stands for Local Time Offset (GMT) shall be entered. 1 LTO means 30 minutes.

Parameter	Input Range	Default	Description
YEAR	1900 ~ 2200	2005	Year setting
MONTH	1 ~ 12	1	Month setting
DAY	1 ~ 31	1	Date setting
HOUR	0 ~ 23	0	Time (Hour) setting
MINUTE	0 ~ 59	0	Minute setting
LTO	-24 ~ 24	0	Local Time Offset. GMT time input 1 LTO = 30 minutes

4.5.4 TESTS

Audio Performance Measurement

TC-2300B enables to measure Audio characteristics such as SINAD of audio signal, Distortion etc. by receiving the audio output signal of DUT through "AUDIO IN" port of front panel. And also it is available to measure several DUTs at the same time by using Distributor provided by option with RF Divider as shown below.

TC-2300B sends the Audio Tone signal to each shield box via RF Divider and measures the receiving performance and sensitivity of DUT by receiving Audio signal from the DUT speaker via Distributor.

Distributor can be controlled through MUX control port of TC-2300B rear panel. As Distributor has 6 ports, it is available to measure 6 DUTs at the same time.

Audio measurement screen shall be switched by pressing TESTS **TESTS** key and it is available to set the threshold of Pass and Fail from the Configuration (F3 **F3**) screen. Actual measurement data shall be displayed in Audio (F1 **F1**) screen and the P/F (Pass or Fail) judgment of each DUT shall be verified from TEST (F2 **F2**) screen.
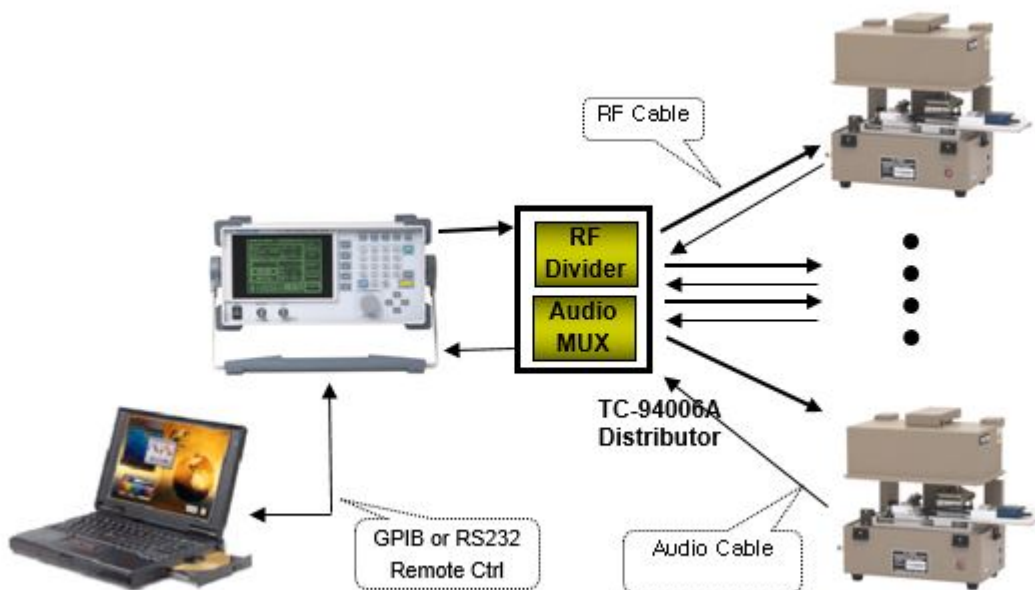
4.5.4.1 Audio(TESTS → F1)

1. Audio → Continuous Mode

Since the Audio Analyzer could not measure signals while it calculates the values, they are not included to the final measurement values even having signal problems in this period. This could be a problem in digital signal rather than analog, so TC-2300B provides Continuous mode which displays the number of normal signals in persentage from among the whole number of single tone signal measuring signals for certain time.
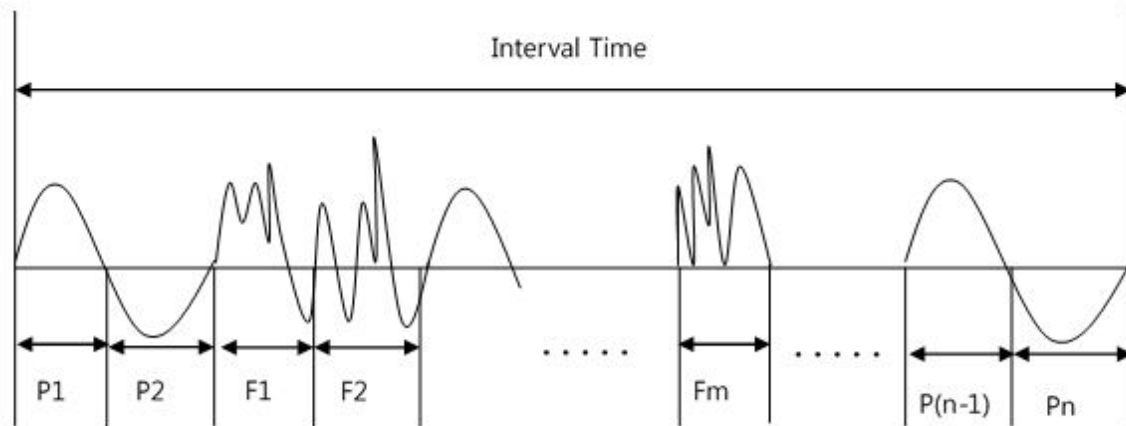
P1 ~ Pn: Normal Tone Signal
F1 ~ Fm: Error Tone Signal

$$RESULT(\%) = \frac{n}{n+m} \times 100$$

Parameter	Input Range	Default	Description
MODE	ANALYZER, CONTIN.	ANALYZER	Select Audio Measurement mode
REPEAT	ON, OFF	ON	Setting if it measure repeat or not
INTERVAL	1 ~ 20	1	Setting measurement time
RESULT			Displays measurement results

2. **Audio/ ANALYZER Mode**

Parameter	Input Range	Default	Description
MODE	ANALYZER, CINTIN.	ANALYZER	Select audio measurement mode
SINAD			SINAD value of DUT audio signal
DISTN			Distortion value of DUT audio signal
FREQ			Frequency value of DUT audio signal
LEVEL			Frequency value of DUT audio signal
REF FREQ	100 HZ, 400 Hz, 1 kHz, 2 kHz, 3 kHz	1 kHz	The base frequency setting for measurement. The audio analyzer analyzes the signal input through AUDIO IN port based on these values.
CHANNEL	1 ~ 6	1	You can change MUX port number and port using Distributor.
AVERAGE	1 ~ 10	1	Decide to take average value when measuring signal values.

4.5.4.2 TEST(TESTS → F2)

Press ENTER ENTER key and the port of Distributor shall be changed automatically and 'Pass' and 'Fail' shall be displayed according to the threshold value set in **[Configuration]**.

CHANNEL	1	2	3	4	5	6
SINAD						
DISTN						
FREQ						
LEVEL						

NOTICE

This is not allowed in "CONTIN" **MODE**.

4.5.4.3   Configuration(TESTS → F3)

Parameter	Input Range	Default	Description
PORT NUM	1 ~ 6	1	Port no. of Distributor
SET TIME	1 ~ 60	3	Automatic change interval time of Distributor
SINAD TH	0 ~ 40.0 dB	30 dB	SINAD threshold value for P/F judgment
DISTN TH	0 ~ 100 %	5.0 %	Distortion threshold value for P/F judgment
FREQ_H_TH	100 ~ 10,000 Hz	1100.0 Hz	Frequency threshold value for P/F judgment
FREQ_L_TH	100 ~ 10,000 Hz	900 Hz	Frequency threshold value for P/F judgment
LEVEL_H_TH	10 ~ 2,000 mV	510.0 mV	Level threshold value for P/F judgment
LEVEL_L_TH	10 ~ 2,000 mV	490.0 mV	Level threshold value for P/F judgment

4.5.4.4 FM / OFDM Signal Generator(TESTS → F4)

TC-2300B has the function of general FM or OFDM signal generator. If selecting SG MODE by FM or OFDM, DAB/DMB signal transmission stops and FM signal or OFDM signal without Null Symbol shall be transmitted. Press ▣ TESTS ▣ F4 to switch to the setting screen.

NOTICE

If setting SG MODE by FM or OFDM, DAB/DMB broadcasting stops.

Parameter	Input Range	Default	Description
MODE	DAB/DMB, FM, FM_STEREO OFDM	DAB/DMB	To select the use of SG function
BAND	Band 2, Band 3 Band L	Band 3	Transmission frequency band setting
FREQUENCY	Band 2 : 87.5 MHz ~108 MHz Band 3 : 165 MHz ~ 250 MHz Band L : 1452 MHz ~ 1492 MHz	205.280 MHz	Transmission frequency setting
POWER	-120 ~ 0 dBm	0 dBm	Transmission output setting
PWR_STEP	0.1 ~ 100.0 dB	1	In case of POWER setting, the step of increase or decrease when pressing ↑ or ↓ key one time
PATH LOSS	0 ~ 50 dB	0 dB	Same as SETUP BASIC PATH LOSS
RF OUT	ON, OFF	ON	Same as SETUP BASIC RF OUT
TONE FRQ	0 ~ 100kHz	0 kHz	Single Tone frequency setting, in case of FM
TONE DEV	-250 ~ 250kHz	0 kHz	FM Deviation setting, in case of FM
TONE_FRQ_R	0 ~ 100 kHz	0 kHz	Right Single Tone frequency setting, in case of FM Stereo
TONE_DEV_R	-280 ~ 280 kHz	0 kHz	Right FM Deviation setting, in case of FM Stereo
TONE_FRQ_L	0 ~ 100 kHz	0 kHz	Left Single Tone frequency setting, in case of FM Stereo
TONE_DEV_L	-280 ~ 280 kHz	0 kHz	Left FM Deviation setting, in case of FM Stereo

4.5.5 User Menu

The frequently used parameters can be registered on the User menu Screen as below in order to use them conveniently.

1. Move the curser to the desired parameter to register.
2. Press [FCN] FCN + [USER MENU] USER MENU to make the check box to be in the check condition.
3. Press [USER MENU] USER MENU to switch into User Screen and check if the parameter was registered or not.
4. Using [F1] F1 ~ [F3] F3 (DEL, UP, DOWN), change the Parameters order of USER MENU order.

4.6 Saving and Recalling Instrument Setups

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 TC-2300B.

SAVE：

1) Make any changes to the instrument that you want to SAVE in a register.

2) Press [FCN] FCN + [Recall] Recall .

3) Select a save number and use the Rotary knob to enter the SAVE name.

4) Press the knob or [ENTER] ENTER key

Recall：

1) Press [Recall] Recall key

2) Use key pad to enter the desired setting number or select it by using the rotary knob or arrow key.

NOTICE

If restarting the system, the most recently saved configuration value shall be set

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5. Application Program

TC-2300B Application Program is used when transmitting the moving picture or audio file from PC to TC-2300B or upgrading the Firmware. For communication between TC-2300B and PC, use the USB to RS232C cable provided together with the product and if not possible, you may use the same type cable selling in the market.

> **NOTICE**
>
> For communication between TC-2300B and PC, the USB to RS232C cable driver should be installed in the PC normally.

5.1 Installation Application Program

5.1.1 Requirements

IBM PC or compatible model (more than Pentium, Windows 2000 / XP)

TC-2300B Application program

5.1.2 Setup

1. Start the system.
2. Execute the TC-2300A_Application.exe file.
3. According to the guideline displayed on the screen, press "Next" button to execute the setup.
4. If 'setup completed' screen appears, press "Finish" button to complete the setup.

5.2 Application Program GUI

5.2.1 Configure(Configuration)

It is for setting up RS232C port number of computer that the application program has been installed already and set-up method is following.

1. Start → Program → TC-2300A_Application.
2. Verify the communication port installed with USB to RS232C cable from Control Panel → System → Device Manager, and set "Port" from Configuration Tab of Program.
3. Verify if TC-2300B is connected by USB to RS232C cable adequately.

Port selection:

In case of setting USB to RS232C, verify the setting port number from control panel.

5.2.2 Audio/Video Transmission

In order to save Audio/Video Data Source in the internal memory, connect **VIDEO/AUDIO** port of TC-2300B rear panel and USB port of PC by USB to RS-232C Cable and execute the following.

⚠ **CAUTION**

If Data Source is Audio, it should be MP2 type, and in case of Video Data, it should be the file that RS Coding and Convolution Interleaving are completed.

> ⚠ **CAUTION**
>
> Please do check the specifications of a USB to RS-232C cable if it is not the one provided from TESCOM. * **Maximum Speed**: 921.6 kbps
> * Connector: DE-09P (DB-9 Male)

1. Connect the USB cable between the **VIDEO/AUDIO** port on the rear side of TC-2300B using the provided USB cable to the USB port of the PC.

2. Press [Setup] **Setup** → [F3] **F3** and move to [FILE] menu.

3. According to the file type to save, select **TYPE** by VIDEO1 ~ 3 or AUDIO1 ~ 3.

4. Turn **DOWNLOAD** "ON". In this case, other keys don't operate.
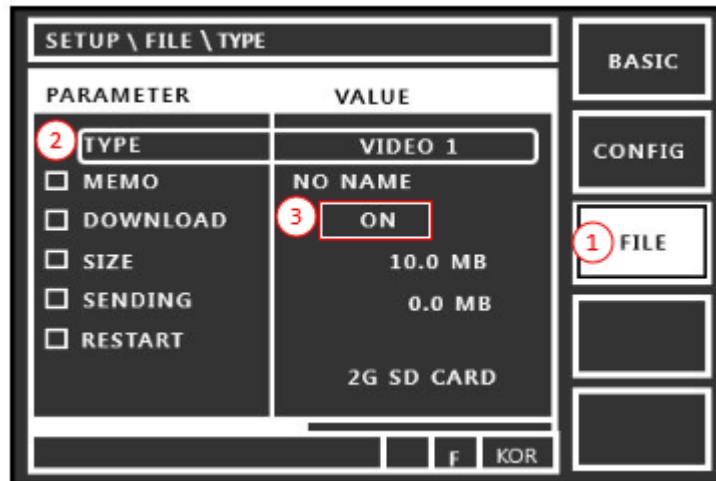
Figure 5-1   Setting screen for file download

5. Execute TC-2300B Application Program on PC.

6. Select Audio/Video Transmission Tab and click "Add" icon to add the desired files to the file list.

7. Check the check box in front of desired file name from the listed files and press "Transfer" button for transmission. During transmission, the proceeding status shall be displayed on the bar below.

NOTICE

1. If file downloading starts, the files in the existing memory shall be deleted.

2. Max file sizes in each memory spaced as below

VIDEO1: 230 M ---- AUDIO1: 30 M
VIDEO2: 100 M ---- AUDIO2: 30 M
VIDEO3: 1500 M --- AUDIO3: 30 M

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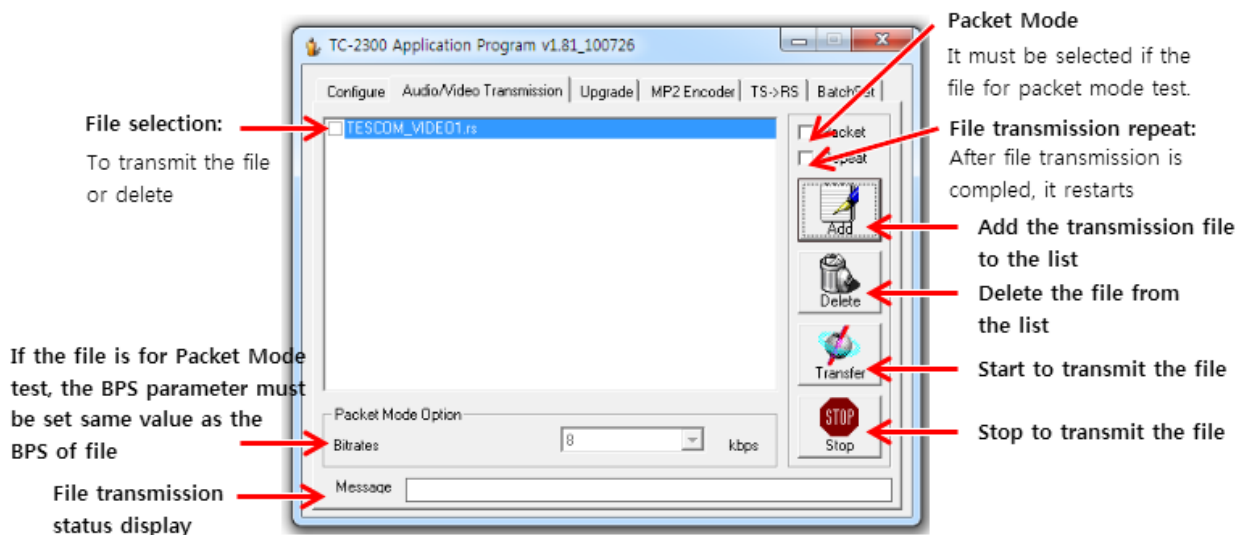
8. If file transmission starts, the size of file saved in SIZE and SENDING shall be displayed on GUI screen of TC-2300B at the real time.

9. If Data transmission ends, turn **DOWNLOAD** "OFF" on TC-2300B.

10. Some explanation of downloaded file could be added using "MEMO" parameter.

⚠ CAUTION

If the file is for packet mode test, Packet" button must be selected and BPS of packet mode option must be set same value of file BPS. Refer to Packet Data mode

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⚠ CAUTION

If there is some problem during downloading the file, the error message will be displayed on the TC2300A/B screen. In this case, please check the RS-232C cable condition and try again.

* **Maximum Speed**: 921.6 kbps

---

* Connector: DE-09P (DB-9 Male)

5.2.3 Upgrade

This function is used for updating TC-2300B's firmware. For more details on Firmware update, please refer to the Firmware Update section in the manual.
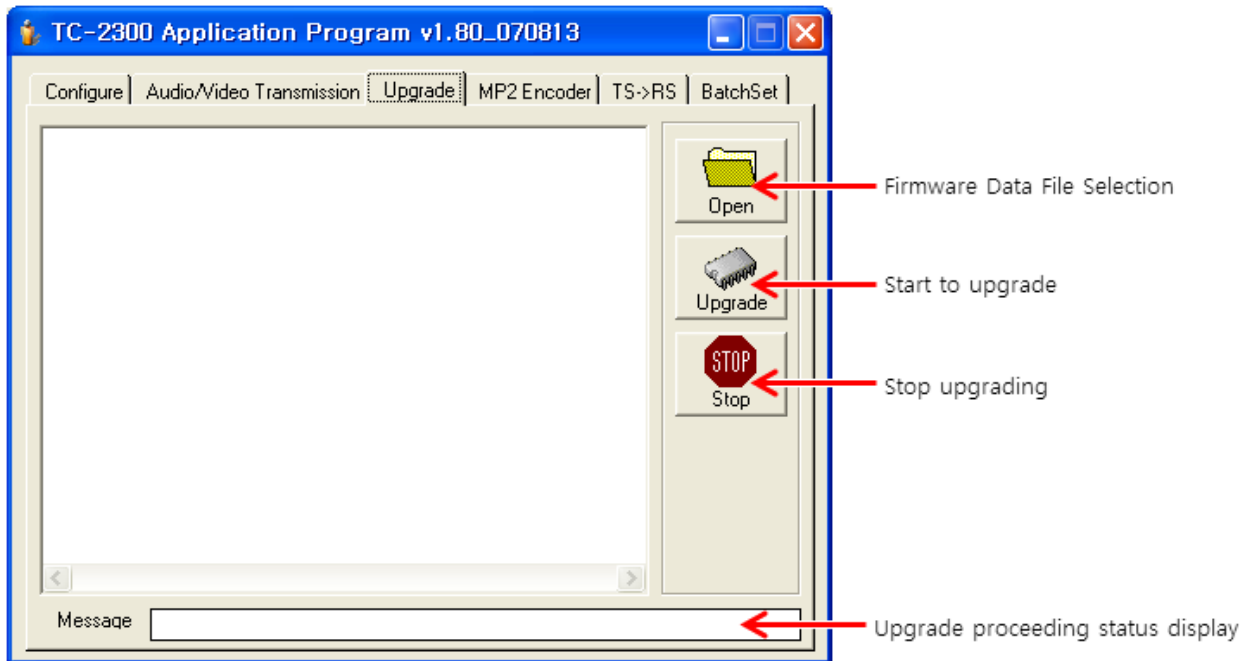
5.2.4 MP2 Encoder

This function converts a wave music file to MP2 format.
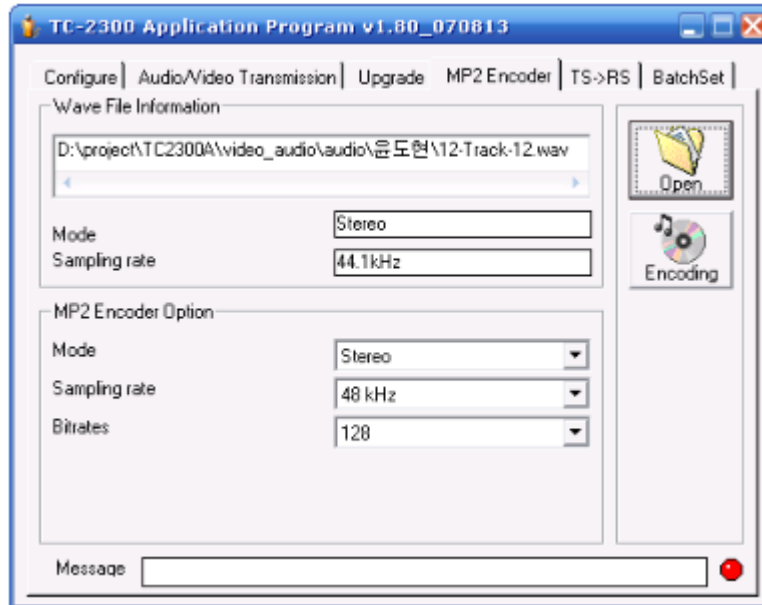
1. Push "Open" icon and select the Wave file. File information will be displayed on Wave File Information window.
2. Select MP2 option using MP2 Encoder Option menu.
3. Push "Encoding" icon to convert the file. The converted file name will be same as wave file and extension of file will be *.mp2.

5.2.5 TS file convert (TS->RS)

This function converts MPEG-TS file to RS format file which is encoded by RS coding and Convolutional interleaving. Only RS format file can be download to the TC2300A for T-DMB testing.

1. Push the "Convert" icon and select TS file.
2. It will convert automatically to RS format file. The file name will be same as TS file name
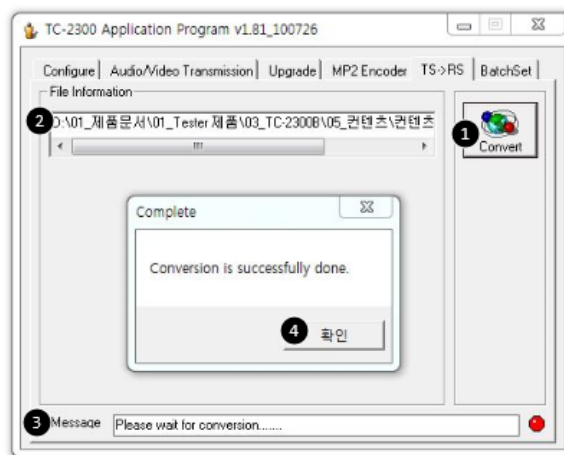
Figure 5-2 TS file convert

5.2.6 Batch Set

This function configures TC2300A/B and save them to internal memory. After saving several configurations, user can select one of them using Recall function.

1. Connect PC and RS-232 port of TC-2300B by USB to RS232C Cross cable.

> ⚠ **CAUTION**
>
> The RS232C Cross cable must be used. It is not included in the basic accessories provided.
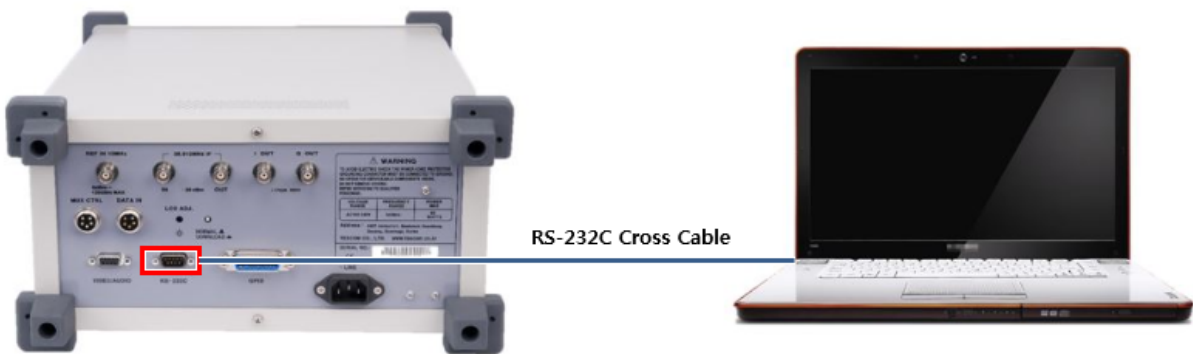
2. Press [Setup] **Setup** → [F2] **F2** and move to [CONFIG] menu.

3. Set the "RMT CTRL" as RS232C and configure the RS232C parameters as bellow.
   - **A.** BPS: 38400
   - **B.** DATA BITS: 8-bit
   - **C.** PARITY: Off
   - **D.** STOP BIT: 1-bit

4. Push "Open" icon and select *.set file which contains several configurations.
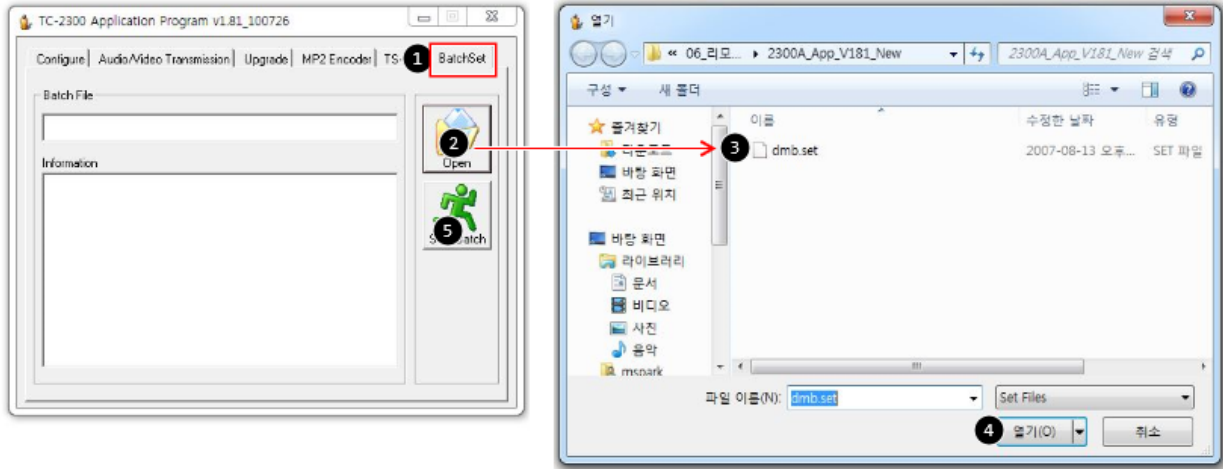
5. Push the "Start Batch" icon to send these configurations using remote control function.
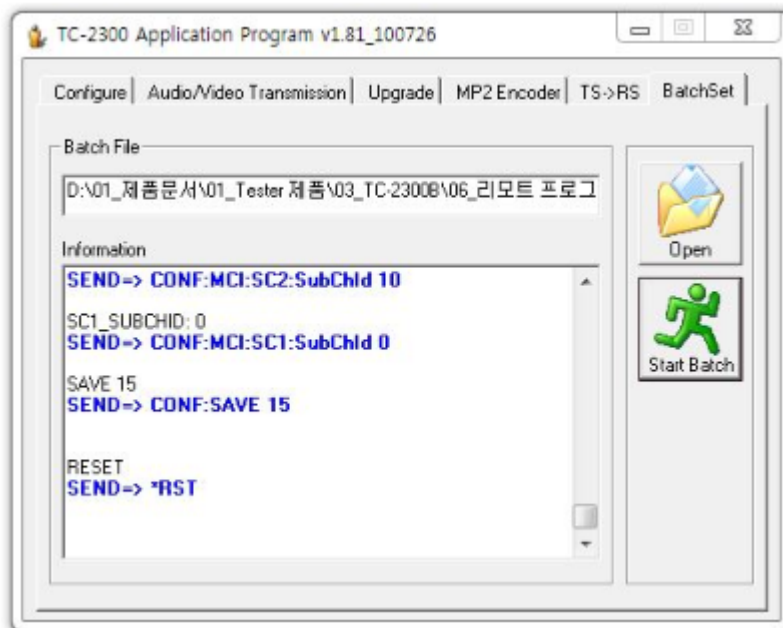
6. *.set file is editable using Text Editor. After editing this file, repeat previous steps,
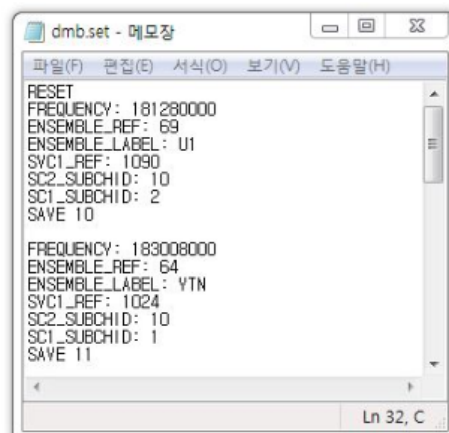
6. DAB/DMB Signal Transmission

There are three ways of transmitting DAB/DMB signal described below.

- Internal Audio/Video Source Data Transmission
- Transfer the data saved in the memory
- External Audio/Video Source Data Transmission

6.1 Internal Audio/Video Source Data Transmission

The test sequence for Internal Audio/Data Source of Service Component is as follows :

1. Press [Setup] **Setup** → [F1] F1 to set the basic information such as frequency, channel, level etc.
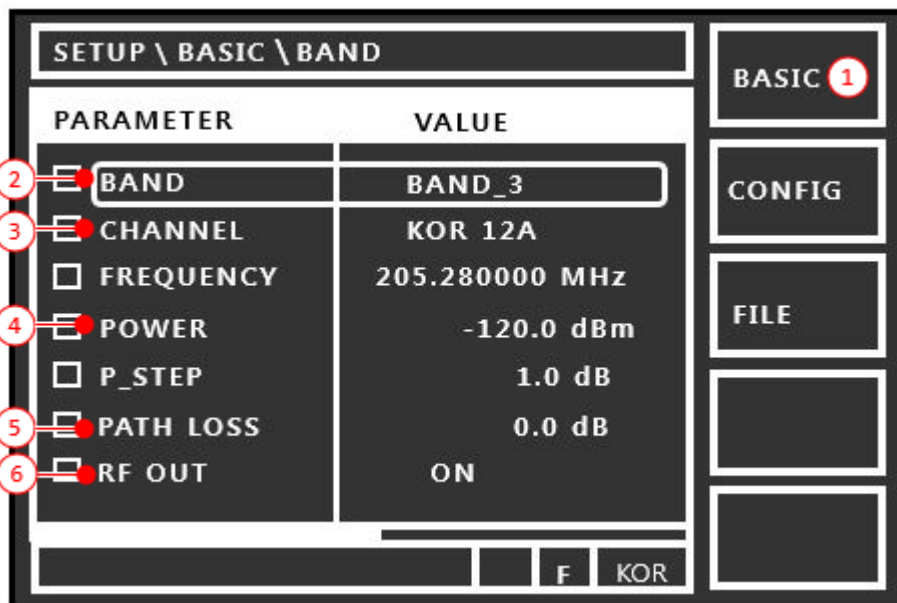
Figure 6-1 Setup Screen for Audio/Video source data transmission

2. Press [MCI] **MCI** key to set Ensemble structure. For default setting value, Service 1 uses Service Component 1 as Primary and Service 2 uses Service Component 2 as Primary. The remaining Service Components are OFF.
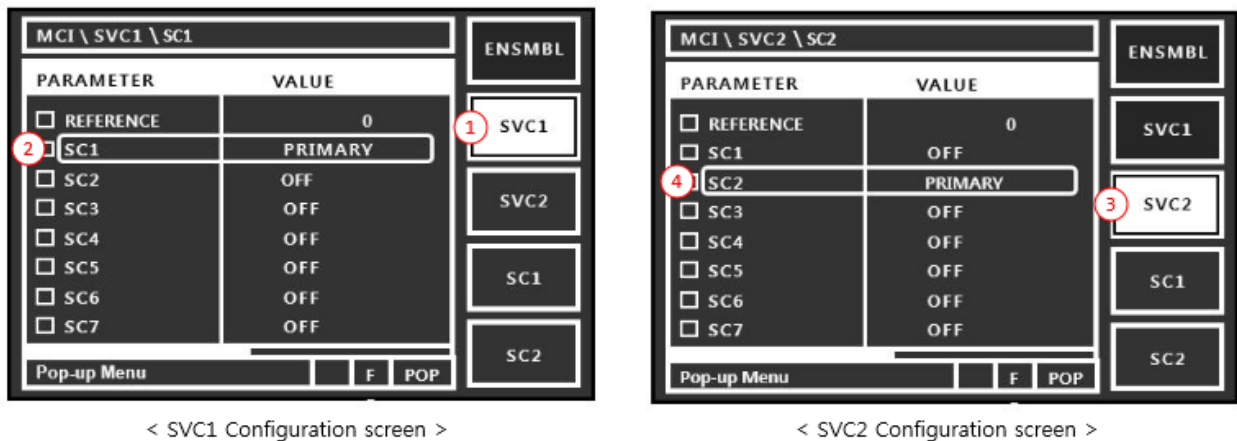
< SVC1 Configuration screen >   < SVC2 Configuration screen >

Figure 6-2   MCI setup screen

3. For SC1(F4) or SC2 (F5) setting, set SC1_Data or SC2_Data as "INTERNAL".
   A. In case that TYPE is Data, select Bit Rate and Data Pattern.
   B. In case that TYPE is Audio, enter the frequency of internal Audio tone, level, Bit Rate.

<SC1 Configuration>   <SC2 Configuration>
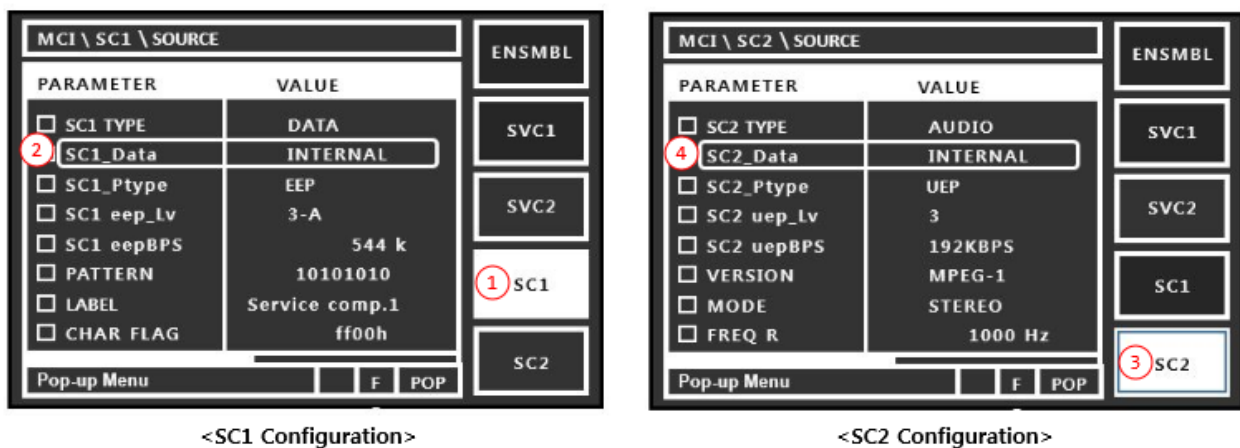
Figure 6-3   Configuration screen for Internal Video or Audio source

4. Verify the Ensemble structure, Audio tone or Data that receives by receiver.

6.2 Transfer the data saved in the memory

1. Press [Setup] **Setup** → [F1] **F1** to set the basic information such as frequency, channel, level etc. and then turn **RF OUT** "ON". (Refer to Setup Screen for Audio/Video source data transmission)

2. Press [MCI] **MCI** key to set Ensemble structure. For default setting value, Service 1 uses Service Component 1 as Primary and Service 2 uses Service Component 2 as Primary. The remaining Service Components are OFF. (Refer to MCI setup screen)

3. For SC1(**F4**) or SC2 (**F5**) setting, set **SC1_Data** or **SC2_Data** as "VIDEO 1 ~ VIDEO 3" or "AUDIO 1" ~ "AUDIO 3"
   A. Enter the Bit Rate for the file saved in the memory. In case of Audio, the Bit Rate is set automatically and the parameter is not displayed.
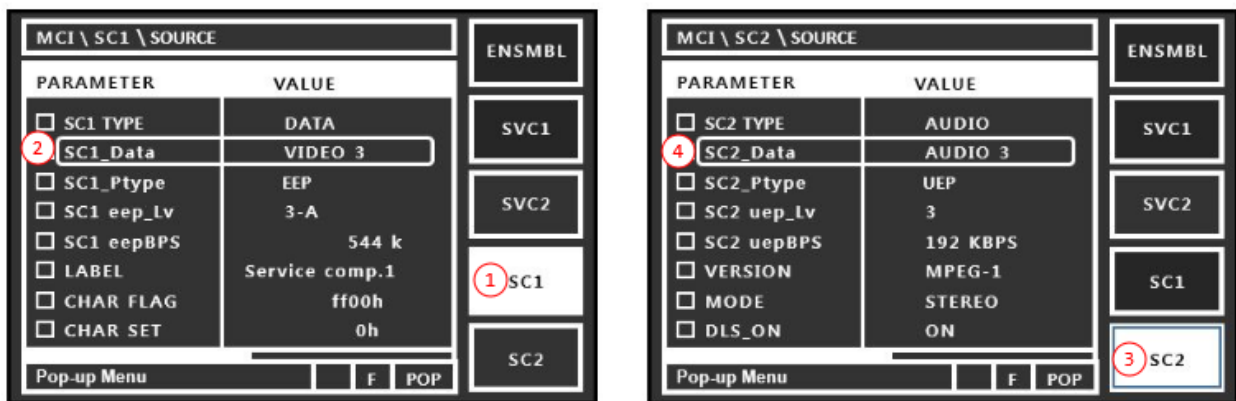
Figure 6-4 Set-up screen of Video and Audio source saved in the memory.

4. Verify the moving picture or audio that receives by the receiver.

6.3 External Audio/Video Source Data Transmission

In order to use External Audio or Video Data source, connect **VIDEO/AUDIO** port of TC-2300B rear panel and USB port of PC by USB to RS232C cable same as the method to download in the memory, and execute the following. If Data source is Audio, it should be MP2 type and in case of Video Data, it should be the file that RS232C Coding and Convolution Interleaving are completed.

1. Connect PC and DATA-IN port of TC-2300B by USB to RS232C cable.

2. Press [Setup] **Setup** → [F1] **F1** to set the basic information such as frequency, channel, level etc. and then turn **RF OUT** "ON". (Refer to Setup Screen for Audio/Video source data transmission)

3. Press [MCI] **MCI** key to set Ensemble structure. For default setting value, Service 1 uses Service Component 1 as Primary and Service 2 uses Service Component 2 as Primary. The remaining Service Components are OFF. (Refer to MCI setup screen)

4. For SC1(**F4**) or SC2 (**F5**) setting, set **SC1_Data** or **SC2_Data** as "EXTERNAL" and enter the Bit Rate for the file to transmit correctly.
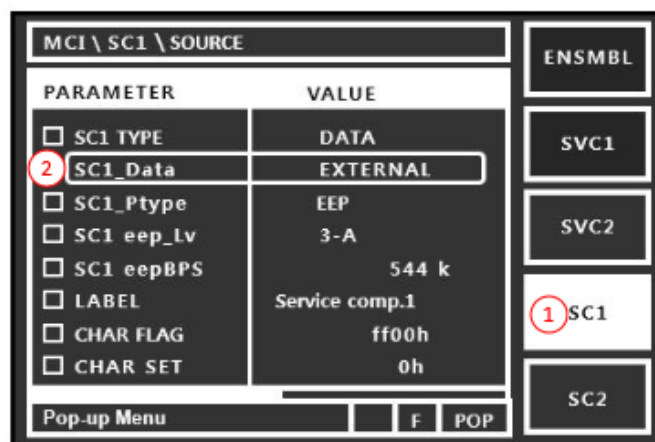
Figure 6-5   EXTERNAL source setting screen

⚠ **CAUTION**

Both SC1 Data and SC2 Data set-up cannot be EXTERNAL at the same time. If SC1_Data is set up as EXTERNAL, set SC2_Data as "INTERNAL", or "VIDEO 1 ~ VIDEO3, or AUDIO 1 ~ AUDIO 3".

5. Execute TC-2300B Application Program on the PC. (Refer to Application Program)

6. Verify the communication port installed with USB to RS232C cable from Control Panel → System → Device Manager, and set "Port" from Configuration Tab of Program.

Port selection:

In case of setting USB to RS232C, verify the setting port number from control panel.
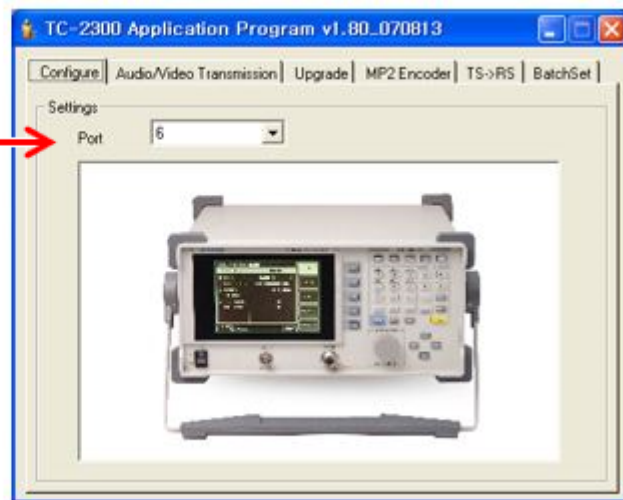
7. Select Audio/Video Transmission Tab and click "Add" icon to add the desired files to transmit to the list.

8. Check the check box in front of the desired file name from the listed files and press "Transfer" button to start the transmission. During transmission, the proceeding status shall be displayed on the bar below.
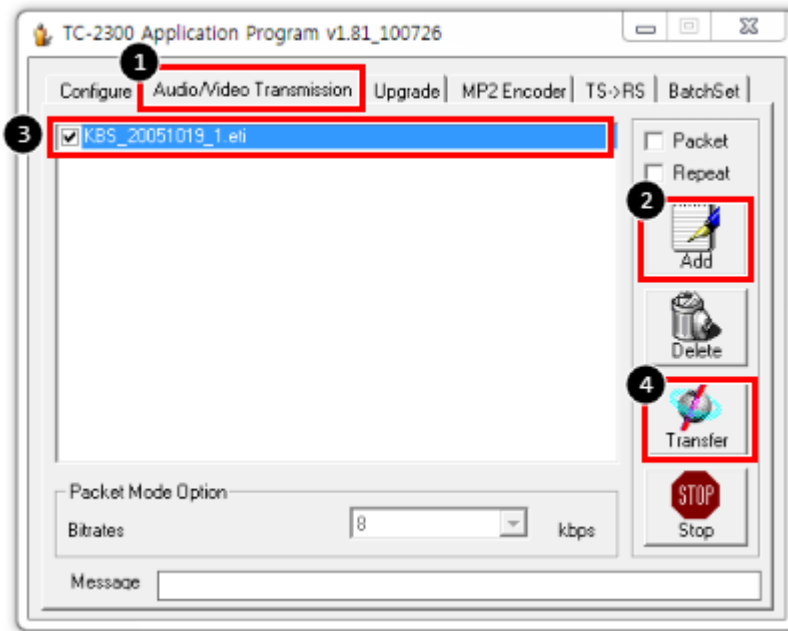
9. Verify if data transmission is completed successfully from TC-2300B as shown on the below.
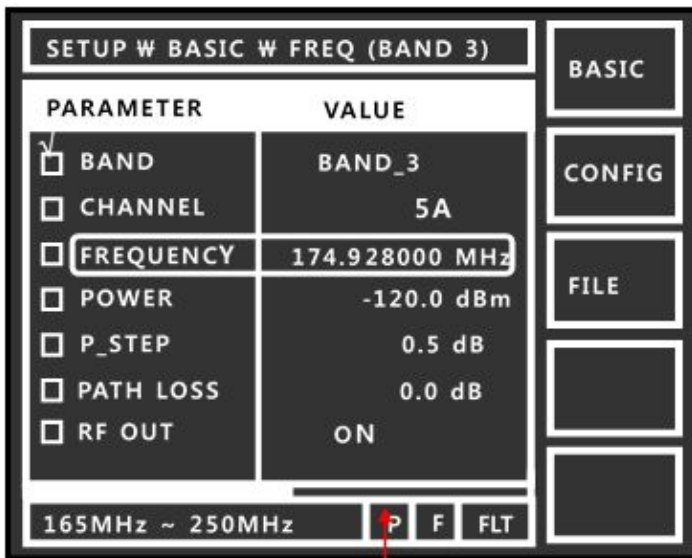
10. If Data is transmitted successfully, verify it by the receiver but if transmission failure is displayed, check and connect the cable again or execute the transmission program again.

6.4 ETI file Transmission

TC-2300B supports ETI file transmission. To use ETI file, refer to ETI Test Solutions

> **NOTICE**
>
> TC-2300B supports only ETI (NI G.703) format file.

PART 3. Performance Test

This section contains information on how to keep the instrument in good working order and check its overall performance.

7. Performance Test

7.1 General Information

The procedures in this chapter allow the verification of the electrical performance of TC-2300B. It contains procedures suitable for determining if the functions of TC-2300B are adjusted properly and whether it meets the performance characteristics as warranted. These tests do not require access to the interior of the instrument.

The setup drawings at the beginning of each test procedure show the test configuration needed for each test. To perform the test procedures, you need to know the basic TC-2300B operation. You should be familiar with the front panel, various test screens, and knob operation. The test procedures give critical instrument settings and connections but not the manufacturing test specification.

7.1.1 Recommended test equipment

The equipment required for the performance tests are listed in the table below. Any equipment that satisfies the critical specifications in the table may substitute the recommended model.

The performance tests are based on the assumption that the recommended test equipment is used. Substituting with alternative test equipment may require the modification of some procedures.

Table 7-1   Measurement List for the User's Device Diagnosis

Description	Minimum Specification	Model
Power Meter	-20 to 27 dBm, 100 kHz to 4 GHz	HP-8482A
Spectrum Analyzer	100 kHz to 6.5 GHz, up to -120 dBm	HP-8561E
Measuring Receiver	0.15 to 1300 MHz, 0 to -130 dBm, Freq Counter	HP-8902A
Signal Generator	100 kHz ~ 3 GHz, +/- 0.5 dB, +20 ~ -120 dBm	HP-8648C
Frequency Counter	+/- 0.1 ppm, 10 Hz ~ 2 GHz, 9 digit	HP-53181A
Network Analyzer	30 kHz to 6 GHz	HP-8753D
Function Generator	1 Hz to 15 MHz	HP-33120A
Down Converter	VSWR <= 1.5, IP1dB >=+5 dBm	HP-11793A

7.1.2 Calibration Cycle

This instrument requires periodic verification of performance. Depending on the use and environmental conditions, the instrument should be checked using the following performance tests at least once every year.

> **NOTICE**
>
> Unless specified otherwise, a warm-up period of 2 hours is required for these tests.

7.1.3 TC-2300B Initial Setup

> **NOTICE**
>
> Before starting measurement, set TC-2300B as described below. In signal generator mode, no cable loss is assumed (Path Loss = 0).

1. Turn on the power .
2. Preheat for two hours.
3. Press [Recall] **Recall** key Select "RESET" from pop-up menu.
4. Press [TESTS] **TESTS** → To access screen, press [F4] **F4** key.

7.2 Signal Generator

7.2.1 Frequency Accuracy

Specification: 100 MHz 1 ppm

Equipment: Frequency Counter, HP53181A

1. Test Setup: Connect equipment as shown in the figure below:

Figure 7-1   Carrier frequencyaccuracy test

2. Set controls of TC-2300B as follows:
   - SG_MODE: FM
   - BAND: BAND_2
   - FREQUENCY: 100.000000 MHz
   - POWER: 0 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - TONE FRQ: 0.000 kHz
   - TONE DEV: 0.000 kHz
   - RF OUT: ON

3. Press "Start" to begin the test and read the frequency from the frequency counter.

7.2.2 CW Mode Power Accuracy

> **Specification:** ±1dB
>
> **Equipment:** Measuring receiver (HP-8902A), Power meter (HP-8482A), Signal Generator (HP-8648C), Down converter

1. Test Setup: Connect equipment as shown in the figure below:
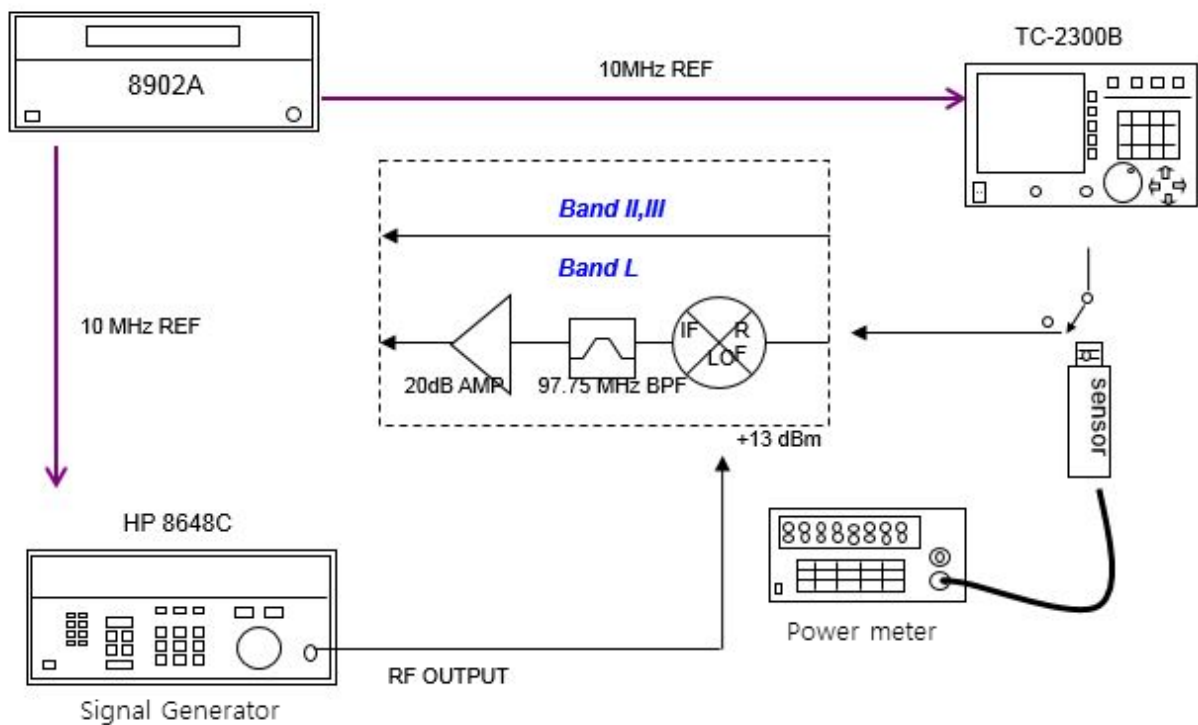
Figure 7-2   Output level accuracy test

2. Set controls of TC-2300B as follows:
   - MODE: SG_FM
   - BAND: BAND_2
   - FREQUENCY: 87.500000 MHz
   - POWER: 0 dBm
   - P_STEP: 1.0 dB
   - RF OUT: ON
   - PATH LOSS: 0.0 dB
   - TONE FRQ: 0.000 kHz
   - TONE DEV: 0.000 kHz

3. Connect the power sensor to TC-2300B.

4. Set TC-2300B output frequency and level according to the table below. Record the power in the table for each setting.

BAND_2

	Frequency		
Level	87.5 MHz	97.75 MHz	108 MHz
0 dBm			
-10 dBm			

BAND_3

	Frequency		
Level	165 MHz	212 MHz	250 MHz
0 dBm			
-10 dBm			

BAND_L

	Frequency		
Level	1452 MHz	1472 MHz	1492 MHz
0 dBm			
-10 dBm			

5. Remove the power sensor and connect the TC-2300B to the Measuring Receiver.

6. Be sure that the measuring receiver is calibrated in Tuned RF mode.

7. Set TC-2300B output frequency and level according to the table below. Record the power in the table for each setting.

BAND_2

	Frequency		
Level	87.5 MHz	97.75 MHz	108 MHz
-10 dBm			
-20 dBm			
-30 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm			
-80 dBm			
-90 dBm			
-100 dBm			
-110 dBm			
-120 dBm			

BAND_3

	Frequency		
Level	165 MHz	212 MHz	250 MHz
-10 dBm			
-20 dBm			
-30 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm			
-80 dBm			
-90 dBm			
-100 dBm			
-110 dBm			
-120 dBm			

BAND_L

	Frequency		
Level	1452 MHz	1472 MHz	1492 MHz
-10 dBm			
-20 dBm			
-30 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm			
-80 dBm			
-90 dBm			
-100 dBm			
-110 dBm			
-120 dBm			

8. Set TC-2300B output frequency and level according to the table below. Set the RF frequency of the HP 8648C to equal the TC-2300B output frequency plus 97.75 MHz. Path loss of Mixer should be added. (Path loss of Mixer is measured at -20 dBm).

BAND_L

	Frequency		
Level	1452 MHz	1472 MHz	1492 MHz
-10 dBm			
-20 dBm			
-30 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm			
-80 dBm			
-90 dBm			
-100 dBm			
-110 dBm			
-120 dBm			

7.2.3 OFDM Mode Power Accuracy

Specification: ±1 dB
Equipment: Measuring receiver(HP-8902A), Power meter(HP-8482A)

1. Test Setup: Connect equipment as shown in the figure below:
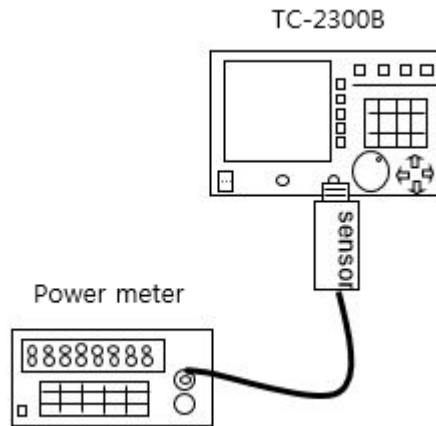
2. Set controls of TC-2300B as follows:
   - SG_MODE : OFDM
   - BAND : BAND_2
   - FREQUENCY : 87.500000 MHz
   - POWER : 0 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON

3. Connect the power sensor to TC-2300B.

4. Set TC-2300B output frequency and level according to the table below. Record the power in the table for each setting.

BAND_2

	Frequency		
Level	87.5 MHz	97.75 MHz	108 MHz
0 dBm			
-10 dBm			
-20 dBm			

BAND_3

	Frequency		
Level	165 MHz	212 MHz	250 MHz
0 dBm			
-10 dBm			
-20 dBm			

BAND_L

	Frequency		
Level	1452 MHz	1472 MHz	1492 MHz
0 dBm			
-10 dBm			
-20 dBm			

7.2.4 In-Band Harmonics/Non-Harmonics spurious

Specification: -40 dBc

Equipment: Spectrum analyzer (HP-8561E)

1. Test Setup: Connect equipment as shown in the figure below:

2. Set controls of TC-2300B as follows:
   - SG_MODE : FM
   - BAND : BAND_2
   - FREQUENCY : 87.500000 MHz
   - POWER : 0 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON
   - TONE FRQ : 0.000 kHz
   - TONE DEV : 0.000 kHz

3. Connect the Spectrum Analyzer to TC-2300B.

4. Press PRESET key of Spectrum Analyzer and set each Band as follows:
   - BAND_2
     - Center Frequency: 100 MHz
     - SPAN: 40 MHz
     - REF LINE: 0 dBm
     - PEAK SEARCH 키를 눌러 MARKER△를 설정한다.
   - BAND_3:
     - Center Frequency: 210 MHz
     - SPAN: 100 MHz
     - REF LINE: 0dBm
   - BAND_L:
     - Center Frequency: 1470 MHz

- SPAN: 50 MHz
- REF LINE: 0 dBm
- PEAK SEARCH 키를 눌러 MARKERΔ를 설정한다.

5. Set TC-2300B output frequency and level according to the table below. To measure spuriousof In-Band, use the NEXT-PEAK function in the Spectrum Analyzer. When the output frequency of the TC-2300B is changed, MARKER Δ should be set again, as in step 4.

BAND_2

	Frequency		
Level	87.5 MHz	97.75 MHz	108 MHz
NEXT PEAK	[dBc]	[dBc]	[dBc]

BAND_3

	Frequency		
Level	165 MHz	212 MHz	250 MHz
NEXT PEAK	[dBc]	[dBc]	[dBc]

BAND_L

	Frequency		
Level	1452 MHz	1472 MHz	1492 MHz
NEXT PEAK	[dBc]	[dBc]	[dBc]

7.2.5 Out-Band Harmonics/Non-Harmonics spurious

> **Specification: -30 dBc**
>
> **Equipment: Specturm analyzer (HP-8561E)**
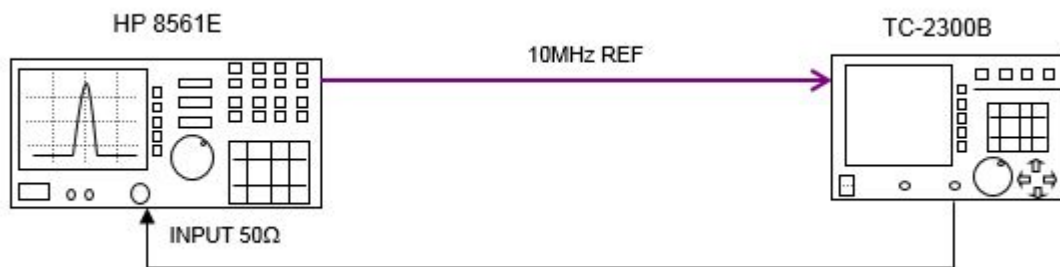
1. Test Setup: Connect equipment as shown in the figure below:

2. Set controls of TC-2300B as follows:
   - SG_MODE : FM
   - BAND : BAND_2
   - FREQUENCY : 87.500000 MHz
   - POWER : 0 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON
   - TONE FRQ : 0.000 kHz
   - TONE DEV : 0.000 kHz

3. Connect the Spectrum Analyzer to the TC-2300B; Set controls of Spectrum Analyzer as follows:
   - Press **PRESET** key
   - SPAN: FULL SPAN
   - REF LINE: 0 dBm
   - Press **PEAK SEARCH** key -> set MARKER Δ

4. Set TC-2300B output frequency and level according to the table below. To measure peaks of In-Band, use the NEXT-PEAK function in the Spectrum Analyzer. When the output frequency of the TC-2300B is changed, MARKER Δ should be set again, as in step 3.

BAND_2

	Frequency		
Level	87.5 MHz	97.75 MHz	108 MHz
NEXT PEAK	[dBc]	[dBc]	[dBc]

BAND_3

	Frequency		
Level	165 MHz	212 MHz	250 MHz
NEXT PEAK	[dBc]	[dBc]	[dBc]

BAND_L

	Frequency		
Level	1452 MHz	1472 MHz	1492 MHz
NEXT PEAK	[dBc]	[dBc]	[dBc]

7.2.6 Residual FM

Specification: ≤ 40 Hz (Band II, III), ≤ 80 Hz (Band L)
Equipment: Measuring Receiver(HP-8902A), Signal Generator(HP-8648C), Down converter

1. Test Setup: Connect equipment as shown in the figure below:
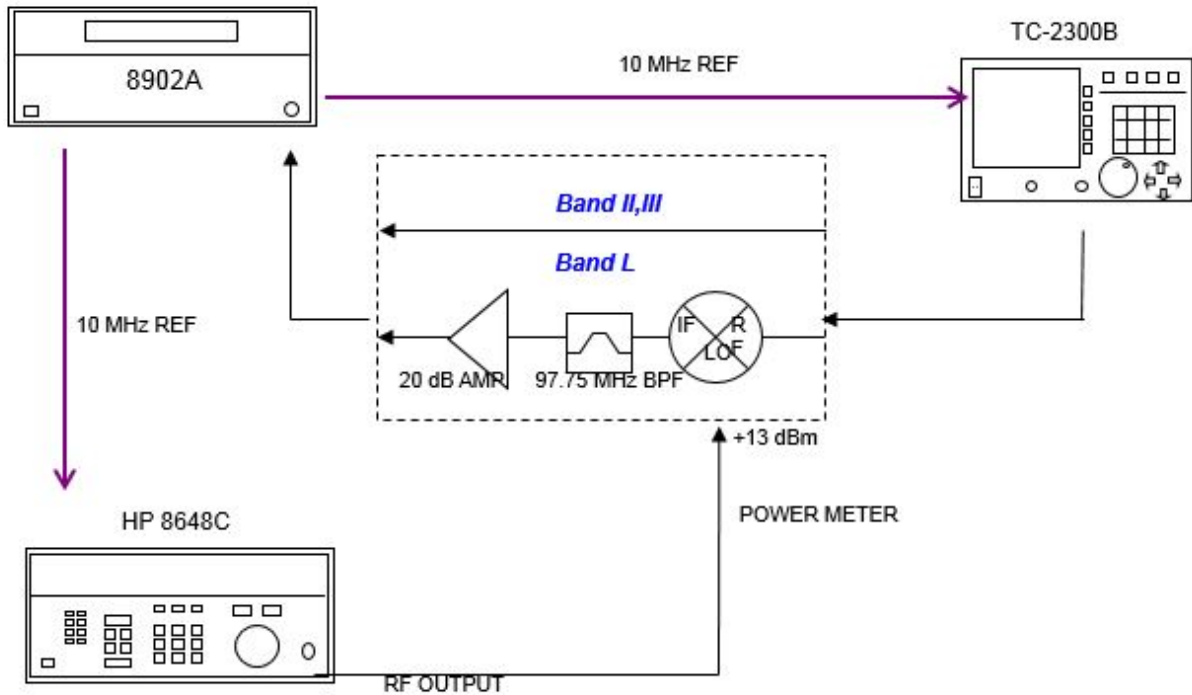
2. Set controls of TC-2300B as follows:
   - SG_MODE : FM
   - BAND : BAND_2
   - FREQUENCY : 97.750000 MHz
   - POWER :-10 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON
   - TONE FRQ : 0.000 kHz
   - TONE DEV : 0.000 kHz

3. Set Measuring Receiver as follows:
   - Press **BLUE** and Press **PRESET** Key
   - Press **FM**.
   - Set HP Filter as 300 Hz.
   - Set LP Filter as 15 kHz.
   - Set DETECTOR as RMS and press **BLUE** key and **AVG** key.

4. Connect the Measuring Receiver to TC-2300B. To measure BAND_L frequency, the Down converter should be used.

5. Set TC-2300B output frequency and level according to the table below. Record the power in the table for each setting.

Residual FM	Frequency		
	97.75 MHz	212 MHz	1472 MHz
RMS	[Hz]	[Hz]	[Hz]

7.2.7 Residual AM

Specification: ≤ 0.5 %
Equipment: Measuring receiver(HP-8902A), Signal Generator(HP-8648C), Down converter

1. Test Setup: Connect equipment as shown in the figure below:

2. Set controls of TC-2300B as follows:
   - SG_MODE : FM
   - BAND : BAND_2
   - FREQUENCY : 97.750000MHz
   - POWER :-10 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON
   - TONE FRQ : 0.000 kHz
   - TONE DEV : 0.000 kHz

3. Set Measuring Receiver as follows:
   - Press **BLUE** and Press **PRESET**
   - Press **AM** key
   - Set HP Filter as 300 Hz.
   - Set LP Filter as 15 kHz.
   - Set DETECTOR as RMS and press **BLUE** key and **AVG** key.

4. Connect the Measuring Receiver to TC-2300B. To measure BAND_L frequency, the Down converter should be used.

5. Set TC-2300B output frequency according to the table below. Record the result in the table for each setting.

	Frequency		
Residual AM	**97.75 MHz**	**212 MHz**	**1472 MHz**
RMS	[%]	[%]	[%]

7.2.8 OFDM Spectrum MASK

Specification: -35 dBc @ 1 MHz offset, 1 dBc @ 720 kHz offset
Equipment: Spectrum analyzer (HP-8561E)

1. Test Setup: Connect equipment as shown in the figure below:
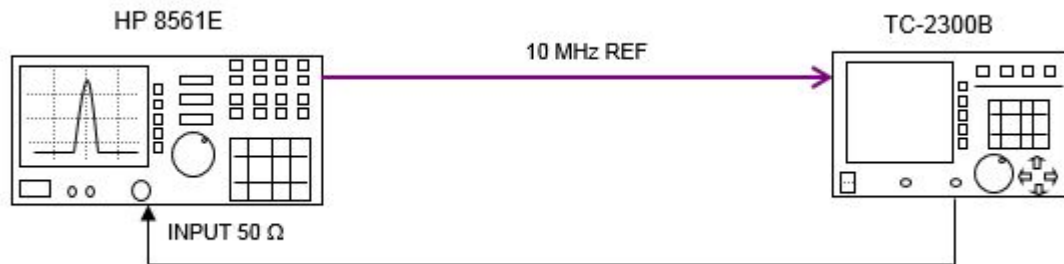
2. Set controls of TC-2300B as follows:
   - SG_MODE : OFDM
   - BAND : BAND_2
   - FREQUENCY : 97.750000 MHz
   - POWER :-10 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON

3. Connect the Spectrum Analyzer to TC-2300B, Set frequency band as follows:

4. Connect the Spectrum Analyzer to TC-2300B, Set frequency band as follows:
   - Press PRESET Key
   - BAND_2
     - Center Frequency: 97.75 MHz
     - SPAN: 3 MHz
     - RBW: 30 kHz, VBW: 10 Hz
     - REF LINE: -10 dBm
     - Press **PEAK SEARCH** -> Set MARKER Δ
   - BAND_3
     - Center Frequency: 212 MHz
     - SPAN: 3 MHz
     - RBW: 30 kHz, VBW: 10 Hz
     - REF LINE: -10 dBm
     - Press **PEAK SEARCH** -> Set MARKER Δ

- ○ BAND_L
  - ▪ Center Frequency: 1472 MHz
  - ▪ SPAN: 3 MHz
  - ▪ RBW: 30 kHz, VBW: 10 Hz
  - ▪ REF LINE: -10 dBm
  - ▪ Press **PEAK SEARCH** -> Set MARKER Δ

5. Set TC-2300B output frequency according to the table below. Record the level in the table for each setting. When the output frequency of the TC-2300B is changed, MARKER Δ should be set again, as in step 3.

BAND_2

	MARKER Frequency			
Level	-1 MHz	-720 kHz	+720 kHz	+1 MHz
	[dBc]	[dBc]	[dBc]	[dBc]

BAND_3

	MAKER Frequency			
Level	-1 MHz	-720 kHz	+720 kHz	+1 MHz
	[dBc]	[dBc]	[dBc]	[dBc]

BAND_L

	MARKER Frequency			
Level	-1 MHz	-720 kHz	+720 kHz	+1 MHz
	[dBc]	[dBc]	[dBc]	[dBc]

7.2.9 Output VSWR

Specification: <1.5
Equipment: **Network analyzer (HP-8753D),**

1. Test Setup: Connect equipment as shown in the figure below:
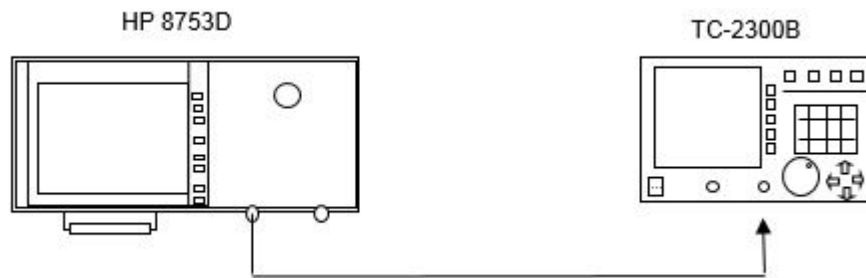
2. Set controls of TC-2300B as follows:
   - SG_MODE: FM
   - BAND : BAND_2
   - FREQUENCY : 97.750000 MHz
   - POWER : 0 dBm
   - P_STEP: 1.0 dB
   - PATH LOSS: 0.0 dB
   - RF OUT: ON
   - TONE FRQ: 0.000 KHz
   - TONE DEV: 0.000 KHz
   - Press **SETUP** key -> Press **F2** -> Select [CONFIG]
   - ENABLE "IF OUT" .

3. Set Network Analyzer as follows:
   - Set Network Analyzer as "S11" mode
     - Press **START** and Select 50 MHz
     - Press **STOP** and Select 1500 MHz
     - Press **FORMAT** and select SWR.

4. Connect PORT1 of Network Analyzer to TC-2300B RF OUT.

5. Set TC-2300B output frequency according to the table below. Record the result in the table for each setting.

	Frequency		
Level	97.75 MHz	212 MHz	1472 MHz
VSWR			

7.3 Audio Analyzer

7.3.1 Audio characteristics

> **Equipment: Function Generator (HP33120A)**
>
> **Specification:**

1. Test Setup: Connect equipment as shown in the figure below:

2. Set controls of TC-2300B as follows:
   - Press TESTS **TESTS** key → Press F1 **F1** and select Audio Analyzer screen
   - Set MODE to ANALYZER

3. Set Function Generator:
   - WAVEFORM : SIN
   - FREQUENCY : 1000 Hz
   - AMP : 1 Vpp

4. Connect Function Generator to TC-2300B Audio IN port.

5. Set AMP of Function Generator according to the table below. Record the level on the table for each setting.

	Amp	
Parameter	**1 Vpp**	**0.2 Vpp**
SINAD		
DISTN		
FREQ		
LEVEL		

PART 4. Programming Guide

The PC may control TC-2300B remotely through the RS232C or GPIB interface using a comprehensive set of commands. This section provides the necessary information to operate TC-2300B under RS232C or GPIB control.

8. Programming Guide

8.1 Introduction

The TC-2300B supports RS232C and GPIB Interface, located at the rear panel for remote operation under PC control. GPIB is used for high speed interfaces because it uses an 8-bit parallel bus. To use GPIB, a special interface card is needed. RS232C is a slow serial interface, but it does not need any special devices, and is easy to use.

8.2 Commands

8.2.1 Command Structure
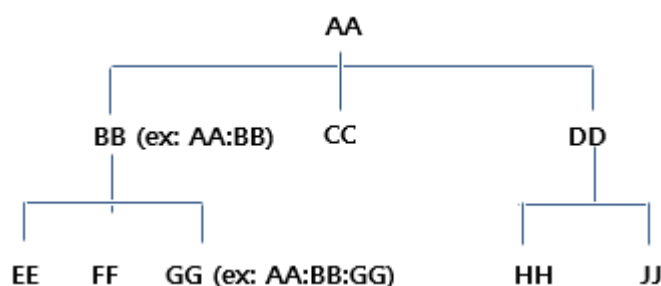
- You must follow a particular path to reach lower level subcommands. For example, if you wish to access the GG command, you must follow the path AA to BB to GG (AA:BB:GG).

- 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 TC-2300B 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 stared with "CONF". For example, one of the set commands is **CONF:SETUP:BASIC:POWER -95** and one of the query commands is **READ:SETUP:BASIC: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

-
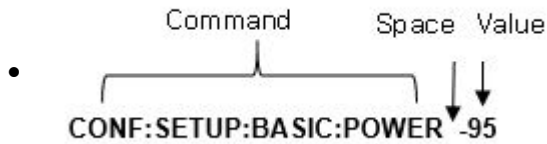
> **NOTICE**
>
> If the RS232C is used for remote control interface, all commands should be finished by LF (Line Feed, Chr(10)).

8.2.2 Command Parameter Types

- Integer Parameter : CONF:SETUP:BASIC:POWER ⟨Value⟩⟨LF⟩
- Discrete Parameter : CONF:SETUP:BASIC:RF {ON | OFF}⟨LF⟩

8.2.3 Responses to Query

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

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

> **NOTICE**
>
> If the RS232C is used for remote control interface, all responses are finished by LF (Line Feed, Chr(10)).

8.3 RS232C Interface

8.3.1 RS232C Connection

The TC-2300B uses a 9-pin RS232C cable. To make a connection to the 25-pin RS232C connector, a 9-pin to 25-pin adapter can be used. The cable pin configuration is shown below.
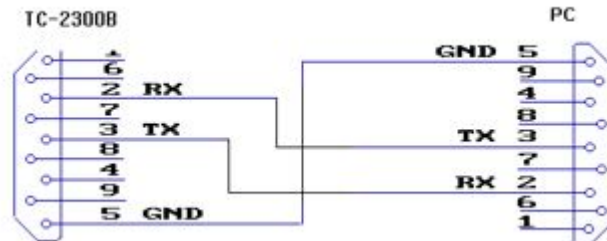
8.3.2 Set up TC-2300B

To use the RS232C, the parameters of the TC-2300B should be set up according to the following sequence

1. Move [CONFIG] screen by pressing **Setup** **Setup** key and **F2** **F2** key.

2. Set **RMT CTRL** parameter as "RS232C".

3. Set **BPS, DATA BITS, PARITY, and STOP BIT** parameters the same as the PC set-up.

Parameter	Range	Default Value	Description
BPS	600, 1200, 1800, 2400,4800, 9600, 19200,38400, 57600, 115200, 230400	19200	Interface speed
DTA BITS	5-bit, 6-bit, 7-bit, 8-bit	8-bit	Length of data bit
PARITY	Off, Even, Odd	Off	Error check bit
STOP BIT	1-bit, 2-bit	1-bit	Number of STOP bit

8.3.3 Remote Programming guide

Remote Programming guide using RS232C on a Windows system

1. **Programming sequence**
   A. Set Port (COM1-COM4).
   B. Set up Baud Rate(9600 bps), Parity Bit (None), Data Bit(8 bit), Stop Bit(1 bit).
   C. Open port (COM1-COM4).
   D. Send RS232C command through serial port.
   E. Check command execution result on TC-2300B screen.
   F. If command execute successfully, response will be sent. Send next command after received response.

2. **Tip for programming**
   A. A colon is used between commands.
   B. A space is only used between parameter values and commands.
   C. All commands should be finished by LF (Line Feed, Chr(10))
   D. If command is write command, response is "ACK" or if command is query, response is query value. You must send next command after response.

8.4 GPIB Interface

8.4.1 Check points to use the GPIB interface

1. Each device should use a unique GPIB address. If one GPIB address is used for two or more devices, those devices will not work.
2. Up to 15 devices can be connected to one GPIB BUS.
3. Up to 20m of cable can be used.
4. More than 2/3 devices must be turned on for stable GPIB network.
5. Star or Linear methods can be used for adding devices to the GPIB network. Loop or Parallel methods are prohibited.
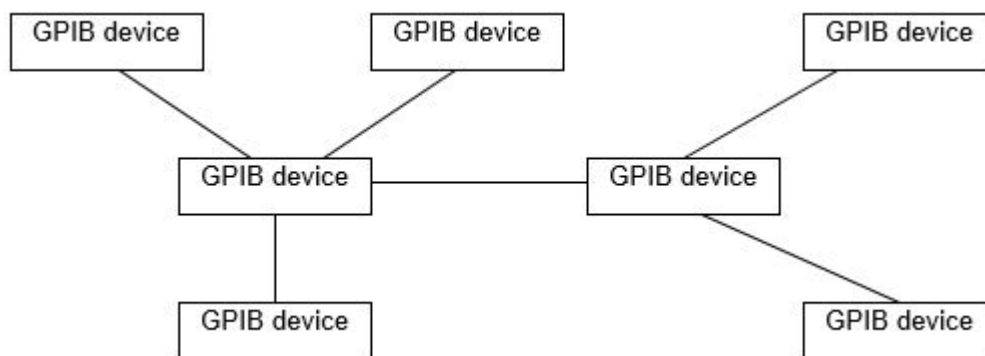
Figure 8-1   Typical GPIB network configuration

8.4.2 Set up TC-2300B

To use the GPIB, the parameters of the TC-2300B should be set up according to the following sequence

1. Move [CONFIG] screen by pressing [Setup] **Setup** key and [F2] **F2** key.
2. Set **RMT CTRL** parameter as "GPIB".
3. Set **GPIB ADDR** parameter the same as the PC set-up. The same address is not allowed for other instruments.

8.5 Command Tables

8.5.1 GPIB Common Commands (IEEE 488.2)

Command	Range	Description
*IDN?	n/a	Identification query
*CLS	n/a	Clear status command
*RST	n/a	Full preset command
*ESR?	n/a	Standard event status register query
*ESE	n/a	Standard event status enable command
*ESE?	n/a	Standard event status enable query
*SRE	n/a	Service request enable command
*SRE?	n/a	Service request enable query
*STB?	n/a	Read status byte query
*OPC	n/a	Operation complete command
*OPC?	n/a	Operation complete query

8.5.2 System Command

Command	Range	Description
READ:EXT_REF?	Query only	State of external reference
EXEC:REMOTE:DISP:ON	n/a	Display remote command on screen
EXEC:REMOTE:DISP:OFF	n/a	Don't remote command on screen
EXEC:REMOTE:EXIT	n/a	Exit from remote mode
CONF:SAVE	1~23	Save all configuration
CONF:RECALL	1~23	Recall saved configuration

8.5.3 Setup BASIC

Command	Range	Description
READ:SETUP:BASIC:FREQ?	Query only	Frequency query
CONF:SETUP:BASIC:FREQ	87.5 ~ 108 (Band II) 174 ~ 250 (Band III) 1452 ~ 1492 (Band L)	Frequency
READ:SETUP:BASIC:POWER?	Query only	Power query
CONF:SETUP:BASIC:POWER	-120.0 ~ 0.0	Power

Command	Range	Description
READ:SETUP:BASIC:PATH_LOSS?	Query only	Path Loss query
CONF:SETUP:BASIC:PATH_LOSS	0.0 ~ 50.0	Path Loss
READ:SETUP:BASIC:RF?	Query only	RF ON/OFF query
CONF:SETUP:BASIC:RF	ON, OFF	RF ON/OFF

NOTICE

Should set enough time(1sec) for delay if you get wanted power exactly after change power.

8.5.4 Setup CONFIG

Command	Range	Description
READ:SETUP:CONFIG:IF_OUT?	Query only	IF OUT status query
CONF:SETUP:CONFIG:IF_OUT	ENABLE, DISABLE	IF OUT enable or disable
READ:SETUP:CONFIG:EXT_IF_IN?	Query only	External IF status query
CONF:SETUP:CONFIG:EXT_IF_IN	ENABLE, DISABLE	External IF enable or disable

8.5.5 Setup File

Command	Range	Description
CONF:SETUP:FILE:RESTART	n/a	Restart downloaded files to play from beginning
READ:SETUP:FILE:TYPE?	Query only	Data Type query
CONF:SETUP:FILE:TYPE		Data Type
READ:SETUP:FILE:DOWNLOAD?	Query only	File Download ON/OFF query
CONF:SETUP:FILE:DOWNLOAD	ON, OFF	File Download ON/OFF
READ:SETUP:FILE:SIZE_V1?	Query only	VIDEO1 file size query
READ:SETUP:FILE:SIZE_V2?	Query only	VIDEO2 file size query
READ:SETUP:FILE:SIZE_V3?	Query only	VIDEO3 file size query
"READ:SETUP:FILE:SIZE_A1?	Query only	AUDIO1 file size query
READ:SETUP:FILE:SIZE_A2?	Query only	AUDIO2 file size query
READ:SETUP:FILE:SIZE_A3?	Query only	AUDIO2 file size query
READ:SETUP:FILE:SD_CARD?	Query only	SD Memory status query

8.5.6 MCI ENSMBL (Ensemble)

Command	Range	Description
READ:MCI:ENSEMBLE:ETI?	Query only	ETI function ON/OFF query?
CONF:MCI:ENSEMBLE:ETI	ON, OFF	ETI function ON/OFF
CONF:MCI:ENSEMBLE:ETI_SOURCE	VIDEO 1~3	ETI Signal source
CONF:MCI:ENSEMBLE:ETI_SOURCE?	Query only	ETI Signal source query
READ:MCI:ENSEMBLE:TXMODE?	Query only	Transmission Mode query
CONF:MCI:ENSEMBLE:TXMODE	1 ~ 4	Transmission Mode
READ:MCI:ENSEMBLE:COUNTRY?	Query only	Country Code query
CONF:MCI:ENSEMBLE:COUNTRY	0 ~15	Country Code
READ:MCI:ENSEMBLE:REF?	Query only	Reference query
CONF:MCI:ENSEMBLE:REF	0 ~ 1048575	Reference
READ:MCI:ENSEMBLE:ECC?	Query only	Enhanced Country Code query
CONF:MCI:ENSEMBLE:ECC	0 ~ 255	Enhanced Country Code
READ:MCI:ENSEMBLE:LABEL?	Query only	Label query
CONF:MCI:ENSEMBLE:LABEL	Max16 characters	Label
READ:MCI:ENSEMBLE:CHARFLAG?	Query only	Character Flag query
CONF:MCI:ENSEMBLE:CHARFLAG	0x0 ~ 0xFF00	Character Flag
READ:MCI:ENSEMBLE:CHARSET?	Query only	Character Set query
CONF:MCI:ENSEMBLE:CHARSET	0x0 ~ 0xF	Character Set
READ:MCI:ENSEMBLE:SVC1?	Query only	Service1 status query
CONF:MCI:ENSEMBLE:SVC1	ON, OFF	Service1 ON/OFF
READ:MCI:ENSEMBLE:SVC2?	Query only	Service2 status query
CONF:MCI:ENSEMBLE:SVC2	ON, OFF	Service2 ON/OFF
READ:MCI:ENSEMBLE:SVC3?	Query only	Service3 status query

8.5.7 MCI SVC1 (Service 1)

Command	Range	Description
READ:MCI:SVC1:REF?	Query only	Reference query
CONF:MCI:SVC1:REF	0 ~ 1048575	Reference
READ:MCI:SVC1:SC1?	Query only	Service Component 1 status query
CONF:MCI:SVC1:SC1	ON, OFF	Service Component 1 ON/OFF
READ:MCI:SVC1:SC2?	Query only	Service Component 2 status query
CONF:MCI:SVC1:SC2	ON, OFF	Service Component 2 ON/OFF
READ:MCI:SVC1:SC3?	Query only	Service Component 3 status query
CONF:MCI:SVC1:SC3	ON, OFF	Service Component 3 ON/OFF

Command	Range	Description
READ:MCI:SVC1:SC4?	Query only	Service Component 4 status query
CONF:MCI:SVC1:SC4	ON, OFF	Service Component 4 ON/OFF
READ:MCI:SVC1:SC5?	Query only	Service Component 5 status query
CONF:MCI:SVC1:SC5	ON, OFF	Service Component 5 ON/OFF
READ:MCI:SVC1:SC6?	Query only	Service Component 6 status query
CONF:MCI:SVC1:SC6	ON, OFF	Service Component 6 ON/OFF
READ:MCI:SVC1:SC7?	Query only	Service Component 7 status query
CONF:MCI:SVC1:SC7	ON, OFF	Service Component 7 ON/OFF
READ:MCI:SVC1:SC8?	Query only	Service Component 8 status query
CONF:MCI:SVC1:SC8	ON, OFF	Service Component 8 ON/OFF
READ:MCI:SVC1:SC9?	Query only	Service Component 9 status query
CONF:MCI:SVC1:SC9	ON, OFF	Service Component 9 ON/OFF
READ:MCI:SVC1:SC10?	Query only	Service Component 10 status query
CONF:MCI:SVC1:SC10	ON, OFF	Service Component 10 ON/OFF
READ:MCI:SVC1:LABEL?	Query only	Label query
CONF:MCI:SVC1:LABEL	Max 16 characters	Label
READ:MCI:SVC1:CHARFLAG?	Query only	Character Flag query
CONF:MCI:SVC1:CHARFLAG	0x0 ~ 0xFF00	Character Flag
READ:MCI:SVC1:CHARSET?	Query only	Character Set query
CONF:MCI:SVC1:CHARSET	0x0 ~ 0xF	Character Set
READ:MCI:SVC1:PROGRAM?	Query only	Program Type query
CONF:MCI:SVC1:PROGRAM	Refer to TC-2300B GUI	Program Type

8.5.8 MCI SVC2 (Service 2)

Command	Range	Description
READ:MCI:SVC2:REF?	Query only	Reference query
CONF:MCI:SVC2:REF	0 ~ 1048575	Reference
READ:MCI:SVC2:SC1?	Query only	Service Component 1 status query
CONF:MCI:SVC2:SC1	ON, OFF	Service Component 1 ON/OFF
READ:MCI:SVC2:SC2?	Query only	Service Component 2 status query
CONF:MCI:SVC2:SC2	ON, OFF	Service Component 2 ON/OFF
READ:MCI:SVC2:SC3?	Query only	Service Component 3 status query
CONF:MCI:SVC2:SC3	ON, OFF	Service Component 3 ON/OFF
READ:MCI:SVC2:SC4?	Query only	Service Component 4 status query
CONF:MCI:SVC2:SC4	ON, OFF	Service Component 4 ON/OFF
READ:MCI:SVC2:SC5?	Query only	Service Component 5 status query
CONF:MCI:SVC2:SC5	ON, OFF	Service Component 5 ON/OFF

Command	Range	Description
READ:MCI:SVC2:SC6?	Query only	Service Component 6 status query
CONF:MCI:SVC2:SC6	ON, OFF	Service Component 6 ON/OFF
READ:MCI:SVC2:SC7?	Query only	Service Component 7 status query
CONF:MCI:SVC2:SC7	ON, OFF	Service Component 7 ON/OFF
READ:MCI:SVC2:SC8?	Query only	Service Component 8 status query
CONF:MCI:SVC2:SC8	ON, OFF	Service Component 8 ON/OFF
READ:MCI:SVC2:SC9?	Query only	Service Component 9 status query
CONF:MCI:SVC2:SC9	ON, OFF	Service Component 9 ON/OFF
READ:MCI:SVC2:SC10?	Query only	Service Component 10 status query
CONF:MCI:SVC2:SC10	ON, OFF	Service Component 10 ON/OFF
READ:MCI:SVC2:LABEL?	Query only	Label query
CONF:MCI:SVC2:LABEL	Max 16 characters	Label
READ:MCI:SVC2:CHARFLAG?	Query only	Character Flag query
CONF:MCI:SVC2:CHARFLAG	0x0 ~ 0xFF00	Character Flag
READ:MCI:SVC2:CHARSET?	Query only	Character Set query
CONF:MCI:SVC2:CHARSET	0x0 ~ 0xF	Character Set
READ:MCI:SVC2:PROGRAM?	Query only	Program Type query
CONF:MCI:SVC2:PROGRAM	Refer to TC-2300B GUI	Program Type

8.5.9 MCI SC1 (Service Component 1)

Command	Range	Description
READ:MCI:SC1:PROTECT?	Query only	Protect Type query
CONF:MCI:SC1:PROTECT	EEP, UEP	Protect Type
READ:MCI:SC1:UEP_LEVEL?	Query only	UEP Level query
CONF:MCI:SC1:UEP_LEVEL	1 ~ 5	UEP Level
READ:MCI:SC1:UEP_BPS?	Query only	Bit Rate query (UEP)
CONF:MCI:SC1:UEP_BPS	32 kBPS, 48 kBPS, 56 kBPS, 64 kBPS, 80 kBPS, 96 kBPS, 112 kBPS, 128 kBPS, 160 kBPS, 192 kBPS, 224 kBPS, 256 kBPS, 320 kBPS, 384 kBPS	Bit Rate (UEP)
READ:MCI:SC1:EEP_LEVEL?	Query only	EEP Level query
CONF:MCI:SC1:EEP_LEVEL	1-A ~ 4-A, 1-B ~ 4-B	EEP Level
READ:MCI:SC1:EEP_BPS?	Query only	Bit Rate query (EEP)

Command	Range	Description
CONF:MCI:SC1:EEP_BPS	8 ~ 1072	Bit Rate (EEP)
READ:MCI:SC1:SOURCE?	Query only	Signal Source status query
CONF:MCI:SC1:SOURCE	INTERNAL, EXTERNAL VIDEO 1~3/AUDIO 1~3	Signal Source
READ:MCI:SC1:TYPE?	Query only	SC 1 Type query
CONF:MCI:SC1:TYPE	AUDIO, DATA	SC 1 Type
READ:MCI:SC1:FREQ_R?	Query only	Tone Frequency (Right) query
CONF:MCI:SC1:FREQ_R	0 ~ 240000	Tone Frequency (Right)
READ:MCI:SC1:FREQ_L?	Query only	Tone Frequency (Left) query
CONF:MCI:SC1:FREQ_L	0 ~ 240000	Tone Frequency (Left)
READ:MCI:SC1:VERSION?	Query only	MPEG Version query
CONF:MCI:SC1:VERSION	MPEG-1, MPEG-2, DAB+	MPEG Version
READ:MCI:SC1:MODE?	Query only	Audio Mode query
CONF:MCI:SC1:MODE	STERO, JOINT, DUAL, MONO	Audio Mode
READ:MCI:SC1:DLS?	Query only	DLS query
CONF:MCI:SC1:DLS	Max 128 Characters	DLS
READ:MCI:SC1:DLS_CHARSET?	Query only	DLS Character Set query
CONF:MCI:SC1:DLS_CHARSET	0x0 ~ 0xF	DLS Character Set
READ:MCI:SC1:PATTERN?	Query only	Data Pattern query
CONF:MCI:SC1:PATTERN	10101010, 11110000 11111111, 00000000 RS_ALL_0, RS_ALL_1	Data Pattern
READ:MCI:SC1:DSCTY?	Query only	DSCTY query
CONF:MCI:SC1:DSCTY	0 ~ 63	DSCTY
READ:MCI:SC1:LABEL?	Query only	Label query
CONF:MCI:SC1:LABEL	Max 16 Characters	Label
READ:MCI:SC1:CHARFLAG?	Query only	Character Flag query
CONF:MCI:SC1:CHARFLAG	0x0 ~ 0xFF00	Character Flag
READ:MCI:SC1:CHARSET?	Query only	Character Set query
CONF:MCI:SC1:CHARSET	0x0 ~ 0xF	Character Set
READ:MCI:SC1:LANGUAGE?	Querly only	Language query?
CONF:MCI:SC1:LANGUAGE	1 ~ 255	Language
READ:MCI:SC1:LEVEL_R?	Query only	Level (right) Query
CONF:MCI:SC1:LEVEL_R	3 ~ -70	Level (right)
READ:MCI:SC1:LEVEL_L?	Query only	Level (left) Query
CONF:MCI:SC1:LEVEL_L	3 ~ -70	Level(left)
READ:MCI:SC1:SubChId?	Query only	Subchannel identification Query
CONF:MCI:SC1:SubChId	0 ~ 54, 63	Subchannel identification
READ:MCI:SC1:PktAddr?	Query only	Packet Address Query

Command	Range	Description
CONF:MCI:SC1:PktAddr	1 ~ 1023	Packet Address identification
READ:MCI:SC1:DG?	Query only	Data group flag Query
CONF:MCI:SC1:DG	ON, OFF	Data Group flag
READ:MCI:SC1:AppType?	Query only	Packet Application Type Query
CONF:MCI:SC1:AppType	0 ~ 2047	Packet Application Type
READ:MCI:SC1:AppData?	Query only	Packet Application Data Query
CONF:MCI:SC1:AppData	0 ~ 255	Packet Application Data
READ:MCI:SC1:FEC?	Query only	Forward Error Correction Query
CONF:MCI:SC1:FEC	ON, OFF	Forward Error Correction
READ:MCI:SC1:ASCTY?	Query only	Audio Service component type Query
CONF:MCI:SC1:ASCTY	0~63	Audio Service component type
READ:MCI:SC1:CA_FLAG?	Query only	Conditional access flag query
CONF:MCI:SC1:CA_FLAG	ON, OFF	Conditional access flag

8.5.10 MCI -> SC2 (Service Component 2)

Command	Range	Description
READ:MCI:SC2:PROTECT?	Query only	Protect Type query
CONF:MCI:SC2:PROTECT	EEP, UEP	Protect Type
READ:MCI:SC2:UEP_LEVEL?	Query only	UEP Level query
CONF:MCI:SC2:UEP_LEVEL	1 ~ 5	UEP Level
READ:MCI:SC2:UEP_BPS?	Query only	Bit Rate query (UEP)
CONF:MCI:SC2:UEP_BPS	32kBPS, 48 kBPS, 56 kBPS, 64 kBPS, 80 kBPS, 96 kBPS, 112 kBPS, 128 kBPS, 160 kBPS, 192 kBPS, 224 kBPS, 256 kBPS, 320 kBPS, 384 kBPS	Bit Rate (UEP)
READ:MCI:SC2:EEP_LEVEL?	Query only	EEP Level query
CONF:MCI:SC2:EEP_LEVEL	1-A ~ 4-A, 1-B ~ 4-B	EEP Level
READ:MCI:SC2:EEP_BPS?	Query only	Bit Rate query (EEP)
CONF:MCI:SC2:EEP_BPS	8 ~ 1072	Bit Rate (EEP)
READ:MCI:SC2:SOURCE?	Query only	Signal Source status query
CONF:MCI:SC2:SOURCE	INTERNAL, EXTENAL VIDEO 1~3/AUDIO 1~3	Signal Source
READ:MCI:SC2:TYPE?	Query only	SC 2 Type query

Command	Range	Description
CONF:MCI:SC2:TYPE	AUDIO, DATA	SC 2 Type
READ:MCI:SC2:FREQ_R?	Query only	Tone Frequency (Right) query
CONF:MCI:SC2:FREQ_R	0 ~ 240000	Tone Frequency (Right)
READ:MCI:SC2:FREQ_L?	Query only	Tone Frequency (Left) query
CONF:MCI:SC2:FREQ_L	0 ~ 240000	Tone Frequency (Left)
READ:MCI:SC2:VERSION?	Query only	MPEG Version query
CONF:MCI:SC2:VERSION	MPEG-1, MPEG-2, DAB+	MPEG Version
READ:MCI:SC2:MODE?	Query only	Audio Mode query
CONF:MCI:SC2:MODE	STERO, JOINT, DUAL, MONO	Audio Mode
READ:MCI:SC2:DLS?	Query only	DLS query
CONF:MCI:SC2:DLS	Max 128 Characters	DLS
READ:MCI:SC2:DLS_CHARSET?	Query only	DLS Character Set query
CONF:MCI:SC2:DLS_CHARSET	0x0 ~ 0xF	DLS Character Set
READ:MCI:SC2:PATTERN?	Query only	Data Pattern query
CONF:MCI:SC2:PATTERN	10101010, 11110000 11111111, 00000000 RS_ALL_0, RS_ALL_1	Data Pattern
READ:MCI:SC2:DSCTY?	Query only	DSCTY query
CONF:MCI:SC2:DSCTY	0 ~ 63	DSCTY
READ:MCI:SC2:LABEL?	Query only	Label query
CONF:MCI:SC2:LABEL	Max 16 Characters	Label
READ:MCI:SC2:CHARFLAG?	Query only	Character Flag query
CONF:MCI:SC2:CHARFLAG	0x0 ~ 0xFF00	Character Flag
READ:MCI:SC2:CHARSET?	Query only	Character Set query
CONF:MCI:SC2:CHARSET	0x0 ~ 0xF	Character Set
READ:MCI;SC2;LANGUAGE?	Querly only	Language query?
CONF;MCI;SC2;LANGUAGE	1 ~ 255	Language
READ:MCI:SC1:LEVEL_R?	Query only	Level (right) Query
CONF:MCI:SC1:LEVEL_R	3 ~ -70	Level (right)
READ:MCI:SC1:LEVEL_L?	Query only	Level (left) Query
CONF:MCI:SC1:LEVEL_L	3 ~ -70	Level(left)
READ:MCI:SC1:SubChId?	Query only	Subchannel identification Query
CONF:MCI:SC1:SubChId	0 ~ 54, 63	Subchannel identification
READ:MCI:SC1:PktAddr?	Query only	Packet Address Query
CONF:MCI:SC1:PktAddr	1 ~ 1023	Packet Address identification
READ:MCI:SC1:DG?	Query only	Data group flag Query
CONF:MCI:SC1:DG	ON, OFF	Data Group flag
READ:MCI:SC1:AppType?	Query only	Packet Application Type Query
CONF:MCI:SC1:AppType	0 ~ 2047	Packet Application Type

Command	Range	Description
READ:MCI:SC1:AppData?	Query only	Packet Application Data Query
CONF:MCI:SC1:AppData	0 ~ 255	Packet Application Data
READ:MCI:SC1:FEC?	Query only	Forward Error Correction Query
CONF:MCI:SC1:FEC	ON, OFF	Forward Error Correction
READ:MCI:SC2:ASCTY?	Query only	Audio Service component type Query
CONF:MCI:SC2:ASCTY	0~63	Audio Service component type
READ:MCI:SC2:CA_FLAG?	Query only	Conditional access flag query
CONF:MCI:SC2:CA_FLAG	ON, OFF	Conditional access flag

8.5.11 SI RECONF

Command	Range	Description
CONF:SI:RECONF:SWITCHING	ON, OFF	RECONFIGURATION ON/OFF
CONF:SI:RECONF:INTERVAL	1 ~ 62(MAX 6sec)	RECONFIGURATION START INTERVAL

8.5.12 SI ANNCE

Command	Range	Description
CONF:SI:ANNCE:SWITCHING	ON, OFF	Announcement ON/OFF
CONF:SI:ANNCE:ASW	ALARM, TRAFFIC, TRAVEL, WARNING, NEWS, WEATHER, EVENT, SPECIAL, RAD_INFO,SPORTS, FINANCE	Announcement ASW
CONF:SI:ANNCE:SC	SC 1(~10)	Service Component choice
CONF:SI:ANNCE:CLUSTER	0 ~ 255	Announcement Cluster
CONF:SI:ANNCE:ALARM	ON, OFF	ALARM
CONF:SI:ANNCE:TRAFFIC	ON, OFF	TRAFFIC
CONF:SI:ANNCE:TRAVEL	ON, OFF	TRAVEL
CONF:SI:ANNCE:WARNING	ON, OFF	WARNING
CONF:SI:ANNCE:NEWS	ON, OFF	NEWS
CONF:SI:ANNCE:WEATHER	ON, OFF	WEATHER
CONF:SI:ANNCE:EVENT	ON, OFF	EVENT
CONF:SI:ANNCE:SPECIAL	ON, OFF	SPECIAL
CONF:SI:ANNCE:RAD_INFO	ON, OFF	RAD_INFO
CONF:SI:ANNCE:SPORTS	ON, OFF	SPORTS

Command	Range	Description
CONF:SI:ANNCE:FINANCE	ON, OFF	FINANCE

8.5.13   SI TII

Command	Range	Description
READ:SI:TII:SUB_ID?	Query only	SUB_ID query
CONF:SI:TII:SUB_ID	0 ~ 23	SUB_ID
READ:SI:TII:MAIN_ID?	Query only	MAIN_ID query
CONF:SI:TII:MAIN_ID	0 ~ 69	MAIN_ID
READ:SI:TII:TII?	Query only	TII status query
CONF:SI:TII:TII	ON, OFF	TII ON/OFF

8.5.14   SI TIME

Command	Range	Description
READ:SI:TIME:YEAR?	Query only	Year query
CONF:SI:TIME:YEAR	1900 ~ 2200	Year
READ:SI:TIME:MONTH?	Query only	Month query
CONF:SI:TIME:MONTH	1 ~ 12	Month
READ:SI:TIME:DAY?	Query only	Day query
CONF:SI:TIME:DAY	1 ~ 31	Day
READ:SI:TIME:HOUR?	Query only	Hour query
CONF:SI:TIME:HOUR	0 ~ 23	Hour
READ:SI:TIME:MINUTE?	Query only	Minute query
CONF:SI:TIME:MINUTE	0 ~ 59	Minute
READ:SI:TIME:LTO?	Query only	LTO (Local Time Offset) query
CONF:SI:TIME:LTO	-24 ~ 24	LTO (Local Time Offset)

8.5.15   TESTS -> AUDIO

Command	Range	Description
READ:TESTS:AUDIO:SINAD?	Query only	SINAD query
READ:TESTS:AUDIO:DISTN?	Query only	Distortion query
READ:TESTS:AUDIO:FREQ?	Query only	Frequency query
READ:TESTS:AUDIO:LEVEL?	Query only	Level query

Command	Range	Description
READ:TESTS:AUDIO:MODE?	Query only	Audio Test Mode query
CONF:TESTS:AUDIO:MODE	ANALYZER, CONTIN.	Audio Test Mode
READ:TESTS:AUDIO:REF_FREQ?	Query only	Reference Frequency query
CONF:TESTS:AUDIO:REF_FREQ	100 Hz, 400 Hz, 1 kHz, 2 kHz, 3 kHz	Reference Frequency
READ:TESTS:AUDIO:CHANNEL?	Query only	Audio MUX Channel query
CONF:TESTS:AUDIO:CHANNEL	1 ~ 6	Audio MUX Channel
READ:TESTS:AUDIO:AVERAGE?	Query only	Average query
CONF:TESTS:AUDIO:AVERAGE	1 ~10	Average
READ:TESTS:AUDIO:REPEAT?	Query only	Repeat status query
CONF:TESTS:AUDIO:REPEAT	ON, OFF	Repeat
READ:TESTS:AUDIO:INTERVAL?	Query only	Interval query
CONF:TESTS:AUDIO:INTERVAL	1 ~ 20	Interval
READ:TESTS:AUDIO:RESULT?	Query only	Result query

8.5.16 TESTS -> SG

Command	Range	Description
READ:TESTS:SG:MODE?	Query only	SG Mode query
CONF:TESTS:SG:MODE	DAB/DMB, FM, OFDM	SG Mode
READ:TESTS:SG:TONE_FRQ?	Query only	Tone Frequency query
CONF:TESTS:SG:TONE_FRQ	0 ~ 100	Tone Frequency
READ:TESTS:SG:TONE_DEV?	Query only	FM Deviation query
CONF:TESTS:SG:TONE_DEV	0 ~ 500	FM Deviation
READ:TESTS:SG:TONE_FRQ_R?	Query only	Right Tone Frequency query
CONF:TESTS:SG:TONE_FRQ_R	0 ~ 100	Right Tone Frequency
READ:TESTS:SG:TONE_DEV_R?	Query only	Right Tone FM Deviation query
CONF:TESTS:SG:TONE_DEV_R	0~280	Right Tone FM Deviation
READ:TESTS:SG:TONE_FRQ_L?;	Query only	Left Tone Frequency query
CONF:TESTS:SG:TONE_FRQ_L	0 ~ 100	Left Tone Frequency
READ:TESTS:SG:TONE_DEV_L?;	Query only	Left Tone FM Deviation query

NOTICE

After the following commands, next command should be same command of opposite status Others are ignored.

CONF:SETUP:BASIC:RF ON should follow CONF:SETUP:BASIC:RF OFF.

CONF:SI:RECONF:SWITCHING OFF should follow CONF:SI:RECONF:SWITCHING ON.

CONF:SI:ANNCE:SWITCHING OFF should follow CONF:SI:ANNCE:SWITCHING ON..

PART 5. Appendix

1. TC-2300B FIG Information
2. TC-2300B Service structure information
3. TC-2300B Service Component structure information
4. Possible setting of UEP
5. Possible setting depends on BPS mode
6. TC-2300B Language Information
7. Regional Frequency Table
8. Country ID
9. Character Set
10. Korea T-DMB Service Parameter

Appendix A.

Additional Information

A.1 FIG Information

TC-2300B transmits following FIGs

FIG type	FIG Application	Description
FIG0/0	Ensemble information	Contain information about Ensemble ID and CIF Count
FIG0/1	Sub channel organization	Contain information about size of and number of Sub channel. TC-2300B can support up-to 10 Sub channel.
FIG0/2	Basic Service and Service Component	Contain information about number of Service, characteristics and relationship between Service and Service components. TC-2300B can support up-to 6 Service and 10 Service Component.
FIG0/5	Service Component language	Contain information about language of Service Component
FIG0/8	Service Component global definition	Declare Service Component as global to be used in other Ensembles
FIG0/9	Country, LTO and International table	Contain information about time
FIG0/10	Data and Time	Contain information about time
FIG0/17	Program Type	Contain information about Program type of Service. Ex) new, weather, music etc.
FIG0/18	Announcement Support	Contain information about supported Announcement type
FIG0/19	Announcement switching	Contain information about Announcement
FIG1/0	Ensemble Label	Contain information about Ensemble Label
FIG1/1	Service Label	Audio type Service Label
FIG1/2	Program Type Download	Dynamically define the meaning of a Pty coarse code or a Pty fine code
FIG1/4	Service Component Label	Service Component Label
FIG1/5	Service Label	Data type Service Label

A.2 Service structure information

TC-2300B supports up-to six services. Two services (SVC1~SVC2) are user editable and other four services (SVC3~SVC6) are fixed. Following Table shows the default value of service

	SVC1	SVC2	SVC3	SVC4	SVC5	SVC6
SC1	Primary	Off	Off	Off	Off	Off
SC2	Off	Primary	Off	Off	Off	Off
SC3	Off	Off	Off	Off	Off	Off
SC4	Off	Off	Primary	Off	Off	Off
SC5	Off	Off	Off	Off	Off	Off
SC6	Off	Off	Off	Primary	Off	Off
SC7	Off	Off	Off	Off	Off	Off
SC8	Off	Off	Off	Off	Primary	Off
SC9	Off	Off	Off	Off	Off	Off

A.3 Service Component structure information

TC-2300B supports up-to ten service components. Two service components (SC1~SC2) are user editable and other eight service components (SC3~SC10) are fixed. Following Table shows the default value of service component

	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10
SOURCE	VIDEO 3	VIDEO 3	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal
PROTECT	EEP	UEP	UEP	UEP	UEP	UEP	UEP	UEP	UEP	UEP
PRT LEVEL	3-A	3	2	2	2	2	2	2	2	2
BIT RATE (kbps)	544	128	32	32	32	32	32	32	32	32
TYPE	DATA	AUDIO	AUDIO	AUDIO	AUDIO	AUDIO	AUDIO	AUDIO	AUDIO	AUDIO
FREQ R (Hz)	-	1000	1500	2000	2500	3000	3500	4000	4500	5000
FREQ L (Hz)	-	1000	1500	2000	2500	3000	3500	4000	4500	5000
VERSION	-	MPEG-1	MPEG-1	MPEG-1	MPEG-1	MPEG-1	MPEG-1	MPEG-1	MPEG-1	MPEG-1
MODE	-	Stereo	MONO	MONO	MONO	MONO	MONO	MONO	MONO	MONO

A.4 Possible setting of UEP

Following table shows possible setting of BPS and Protection level for Audio Service Component with UEP protection type.

BPS(kbps)	Protection				
	1	2	3	4	5
32	○	○	○	○	○
48	○	○	○	○	○
56	×	○	○	○	○
64	○	○	○	○	○
80	○	○	○	○	○
96	○	○	○	○	○
112	×	○	○	○	○
128	○	○	○	○	○
160	○	○	○	○	○
192	○	○	○	○	○
224	○	○	○	○	○
256	○	○	○	○	○
320	×	○	×	○	○
384	○	×	○	×	○

A.5 Possible setting depends on BPS mode

Following table shows possible setting of BPS and Mode for Audio Service Component with MPEG-1.

BPS(kbps)	Mode			
	stereo	joint	dual	Single
32	×	×	×	○
48	×	×	×	○
56	×	×	×	○
64	○	○	○	○
80	×	×	×	○
96	○	○	○	○
112	○	○	○	○
128	○	○	○	○
160	○	○	○	○
192	○	○	○	○
224	○	○	○	×
256	○	○	○	×
320	○	○	○	×
384	○	○	○	×

Following table shows possible setting of BPS is as follow for Audio Service Component with MPEG-2.

- 8, 16, 24, 32, 40, 48, 56, 64, 80, 96, 112, 128, 144, 160

A.6 TC-2300B Language Information

Following table shows language information used for DAB/DMB.

A.6.1 European languages

⚠ CAUTION

INCLUDE_ERROR(ELEMENT_REMOVED)

A.6.2 Other language

⚠ **CAUTION**

INCLUDE_ERROR(ELEMENT_REMOVED)

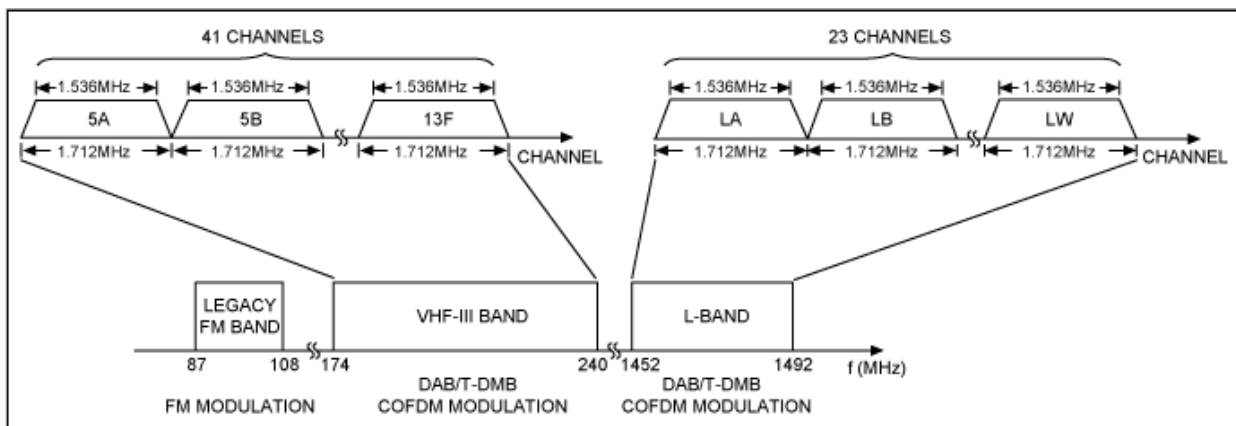# A.7 Regional Frequency Table

A.7.1 BAND_3

> ⚠️ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

A.7.2 Band_L

> ⚠️ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

> 💡 Band-Ⅰ : 47~68MHz (DRM+)
> Band-Ⅱ : 87.35~108MHz (FM, DRM+)
> Band-Ⅲ : 174~230MHz (DAB, DVB-T)
> Band-Ⅳ/Ⅴ : 470~862MHz (DVB-T/H)
> Band-L : 1452~1490MHz(DAB, Satellite Radio)

> 💡 T-DMB(Korea) : H.264 @30fps (320 x 240)
> BSACT-DMB(China) : H.264 @30fps (320 x 240), AAC+/BSAC

A.8 Country ID

A.8.1 ITU Region 1 (European broadcasting area)

> ⚠ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

A.8.2 ITU Region 1 (African broadcasting area)

> ⚠ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

A.8.3 ITU Region 1 (Former Soviet Union broadcasting area)

> ⚠ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

A.8.4 ITU Region 2 (North and South America)

> ⚠ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

A.8.5 ITU Region 3 (Asia and Pacific)

> ⚠ **CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

A.9 Character set

Qualify the character information contained in the FIG type 1 field. The following character sets are defined

0 : complete EBU Latin based repertoire

1 : EBU Latin based common core, Cyrillic, Greek

2 : EBU Latin based core, Arabic, Hebrew, Cyrillic and Greek

3 : ISO Latin Alphabet No 2

f : ISO 10646-1 using UTF-8 transformation format

The remaining codes are reserved for future definition.

A.10 Korea T-DMB Service Parameter

Data Collected: 2006. 05. 12

We will update this list of parameter when it changed.

> **⚠ CAUTION**
>
> INCLUDE_ERROR(ELEMENT_REMOVED)

Appendix B.

BER TEST

B.1 BER Test Solutions

(since s/w version 1.150)

B.1.1 Introduction

There are several test methods to estimate a receiver quality such as receiving sensitivity, frequency selectivity etc. BER can be a standard method to decide normal receiving status to measure items above. So it is very important to measure BER test effectively and precisely for the receiver quality examinations. It could be several methods to measure BER, This instruction explains two methods using Data Pattern which is predefined and using Audio Analyzer function of TC-2300A/B.

DAB system is designed to transfer several broadcasts simultaneously. Fig1 is the block diagram of DAB transfer system. Seeing that possible broadcasting contents, there are movie service channels added from Korea, channels for data service and channels for audio service. However looking at processing data procedure, all channels are passed through the same procedure. Therefore if we measure BER using a channel randomly, we can decide the others would have same BER values.
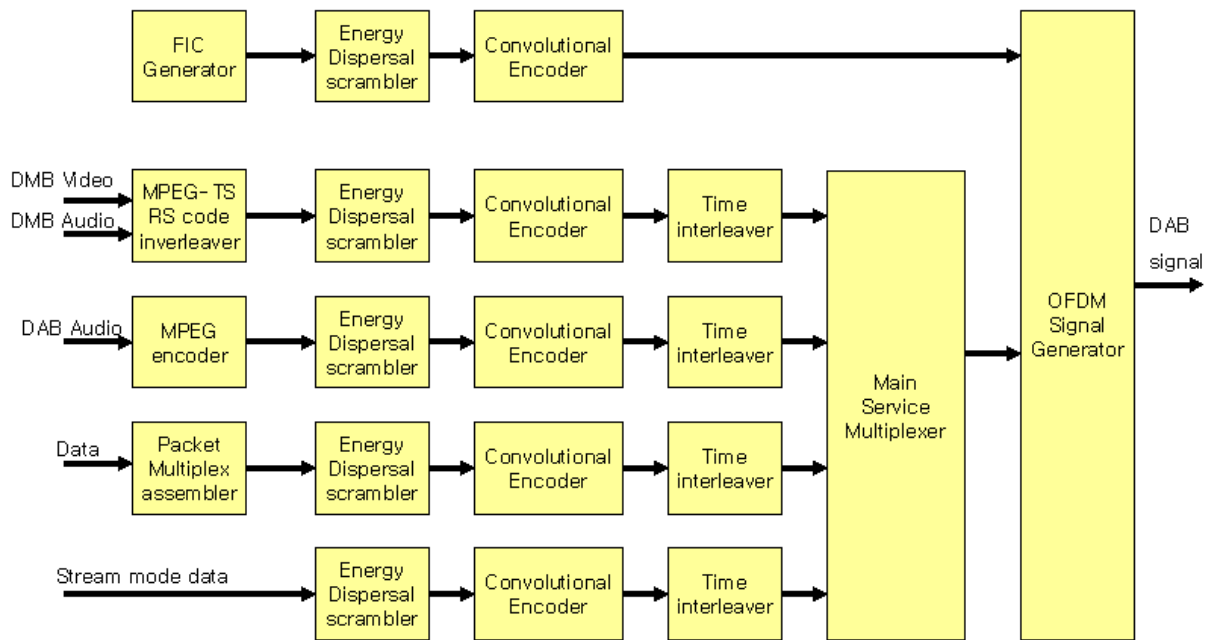
Figure B-1   DAB/DMB Transmitter Block diagram

B.1.2   BER test using fixed data pattern (PRBS)

In this chapter propose the BER measurement method using stream mode data channel. Measure stream mode data a using pre-defined pattern at the receiver. Fig 1. shows the data input going through Energy Dispersal Scrambler. This block is to randomize the data input using PRBS generator. Although the input data are all '0', all '1' or having certain pattern, if the output data of block is PRBS Random data, consequently the data passing through from RF block have PRBS Random features.

To measure the BER using this method, the test program(BER Meter)should be added at the inside of receiver shown at Fig 2. BER Meter is a self-calculating block analyzing data from TC-2300A/B data and differences after decoding Steam Mode Data from TC-2300A/B.

TC-2300A/B Parameter Setting for BER test using Fixed Data Pattern shows equipment setting for BER test using Fixed Data Pattern. TC-2300A/B Parameter Setting for BER test using Fixed Data Pattern is made by base parameter which is changed from reset status. For Reset, select from pop-up menu of Recall key.

B.1.2.1 Basic Setting

Verify that Service Component is set as Data channel for BER test. Press MCI key at Main Function, press F4 to move SC1 screen, and set Parameters below.

Table B-1   TC-2300A/B Parameter Setting for BER test using Fixed Data Pattern

Parameter	Default	User define
SOURCE	INTERNAL	INTERNAL
PROTECT	UEP	EEP
PRT LEVEL	3-A	3-A (recommended)
BIT RATE	128K	576K (recommended)
TYPE	AUDIO	DATA
PATTERN	10101010	00000000 (recommended)

The reason for recommending PRT LEVEL 3-A is using 3-A in Korea DMB. If you change PRT LEVEL, you need to compare the value after setting the same value because BER value is changed. When you finish the setting like above, connect to the receiver after setting frequency and power which is going to be used. Now we have to consider the interference from external signals. If the external signals(public radio signal) are coming like output signal or even more strong, the BER value is influenced from it, using shield room or shield box is recommended for shielding. In no case shielding, it is good to use unreserved channel to minimize the interferences.
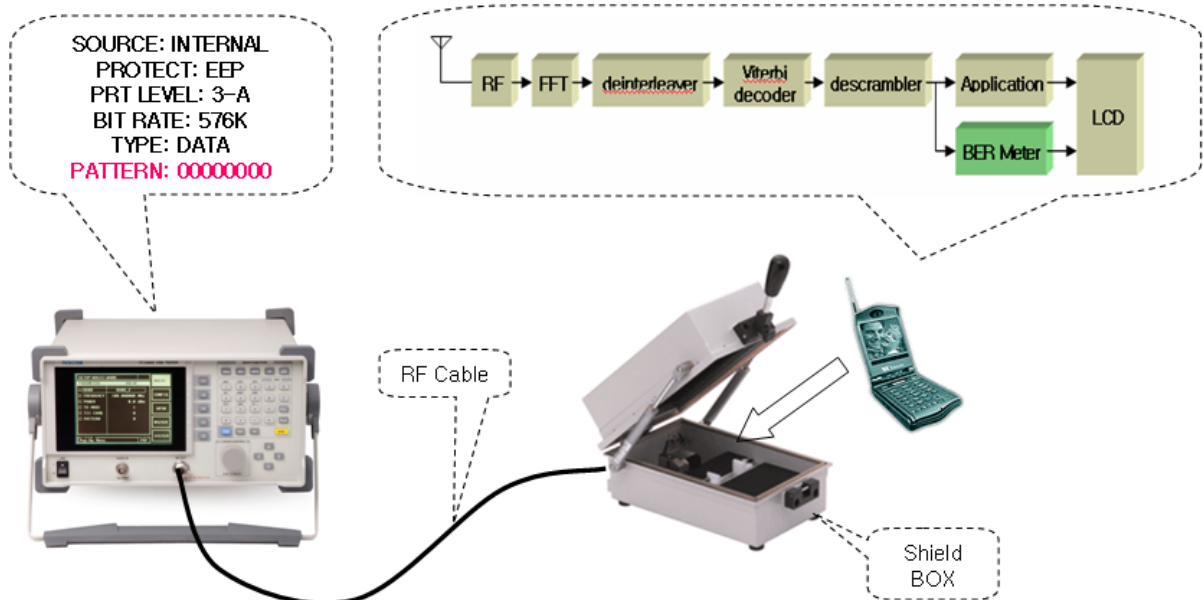
B.1.2.2 BER Measurement Configuration

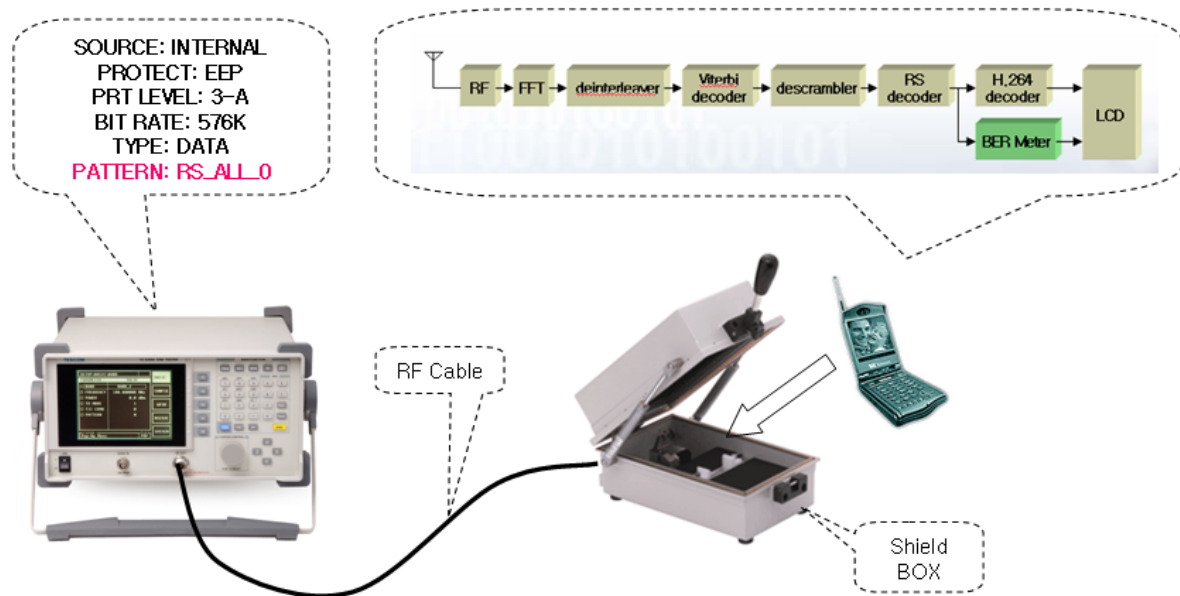
Figure B-2   BER Test of DAB using Fixed Data Pattern

Figure B-3 BER Test of DMB using Fixed Data Pattern

B.1.2.3 BER Measurement

BER is measured at receiver and error counting program should be programmed in receiver. Set the tester to receive Service Component which is set in TC-2300A/B Parameter Setting for BER test using Fixed Data Pattern using DAB Decoder chip of receiver. The Decoder Chip's output data is the same with TC-2300A/B Pattern as to most of Decoder chip output data after processing reversely sending block of BER Test of DAB using Fixed Data Pattern . If pattern data is set '00000000', the output of Decoder chip is all '0'. Receiving '1' bit is regarded as an error.

A lot of data should be collected for the reliable BER value. In case of using this proposed method, likelihood using Random Data of PRBS because of 'Energy Dispersal Scrambler' of DBA system, 'Monte Carlo Sampling' could be applied when we calculate BER reliability. For example, for the reliable BER of 10E-4, over 1,000,000 bit(one hundred times) should be measured. Accordingly, in case of setting 576KBPS Data rate, we can get reliable data using data which is received over two second.

B.1.3 BER test using Audio Analyzer

This chapter introduces indirect BER measurement to measure audio quality using Audio analyzer. While the procedure in BER test using fixed data pattern (PRBS) is only possible in case of adding BER Meter program, this chapter propose a good solution without adding other program or devices, also can measure audio quality and BER at the same time.

The basic concept of using Audio Analyzer for BER test is in case that the receiver can get DAB/DMB RF signal from TC-2300A/B, the output signal from speaker or ear jack going well, in case that the receiver doesn't get the signal from TC-2300A/B, the audio signal could be distorted or no signal. So analyzing audio output signal using audio analyzer can be a testing standard whether the receiver is receiving RF signal or not.

B.1.3.1 Basic Setting

Set Service Component of TC-2300A/B to audio channel and set audio signal to 1 kHz tone. The speaker output signal became to 1 kHz tone signal, verify measuring the quality of output tone signal. For this test, set Service Component as below and press MCI MCI key at Main Function key to move Service Component screen and set the parameter as below.

Table B-2   TC-2300A/B Parameter Setting for BER test using Audio Analyzer

Parameter	Default	User define
SOURCE	INTERNAL	INTERNAL
PROTECT	UEP	UEP
PRT LEVEL	3-A	3 (recommended)
BIT RATE	128 K	192 K (recommended)
TYPE	AUDIO	AUDIO
FREQ R/L	1000 Hz	1000Hz
VERSION	MPEG-1	MPEG-1 (recommended)
MODE	STEREO	STEREO (recommended)

B.1.3.2 BER measurement system configuration using audio Analyzer

SOURCE: INTERNAL
PROTECT: UEP
PRT LEVEL: 3
BIT RATE: 192K
TYPE: AUDIO
FREQ: 1kHz

Shield BOX

RF Cable

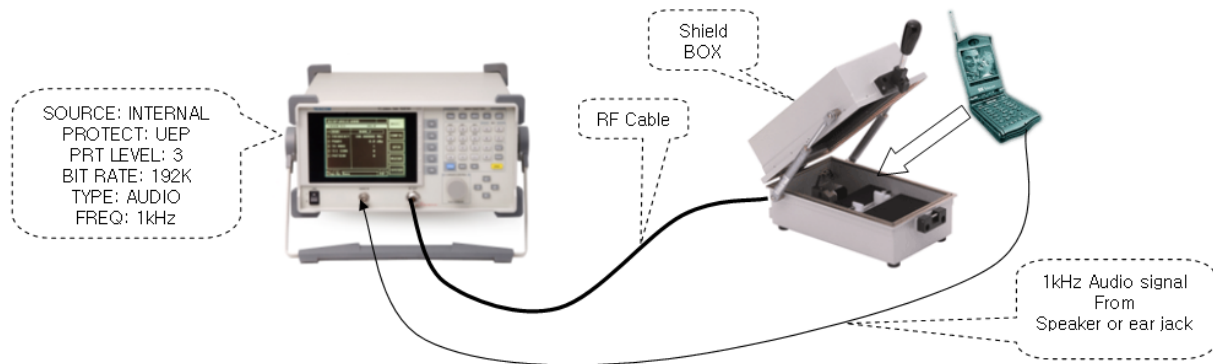1kHz Audio signal From Speaker or ear jack

Figure B-4   System Block Diagram for BER Test using Audio Analyzer

B.1.3.3 BER measurement

System Block Diagram for BER Test using Audio Analyzer Input audio output signal to audio analyzer input port of TC-2300A/B and measure the input audio status from the receiver using audio analyzer screen of TC-2300A/B. To move Audio Analyzer screen, press TESTS key at Main Function, press F1 to select AUDIO. There is Analyzer mode and Continuous Mode in Audio measurement mode, using Continuous mode is recommended for BER Test.

1. Audio Measurement for Analyzer Mode

Set ANALYZER mode on Audio Display to analyzer mode. SINAD, DISTORTION, LEVEL, FREQ are measured in this mode. If the quality of audio output from receiver speaker is satisfactory, SINAD is measured in high value(for example, over 35 dB), DISTORTION is lower(less than 5%). Therefore we can decide whether the current receiver is receiving the RF signal correctly using SINAD, DISTORTION and LEVEL.

2. Audio Measurement for Continuous Mode

SINAD or Distortion is suitable for the analog system. A Digital system like DAB/DMB has unique characteristic when audio quality vary as receiving status of Data Packet is good, when it is bad the quality falls rapidly on the contrary. So if we use audio quality measurement using SINAD or DISTORTION proposed at 3.3.1, in case of having big differences from measured data, sometimes some errors could be happened defining bad product to good one. In case of Digital system, it is more effective that whether there is a signal cutoff for certain time or not(for example, 3 second).

When Audio Analyzer is set Continuous mode, the RESULT is displayed and the result is measured in %. Set the measuring time by changing INTERVAL value. The RESULT value means, if in case audio signal is input for the INTERVAL section without cutoff at all, it has 100% value. If it has cutoff, the measured value is declined.
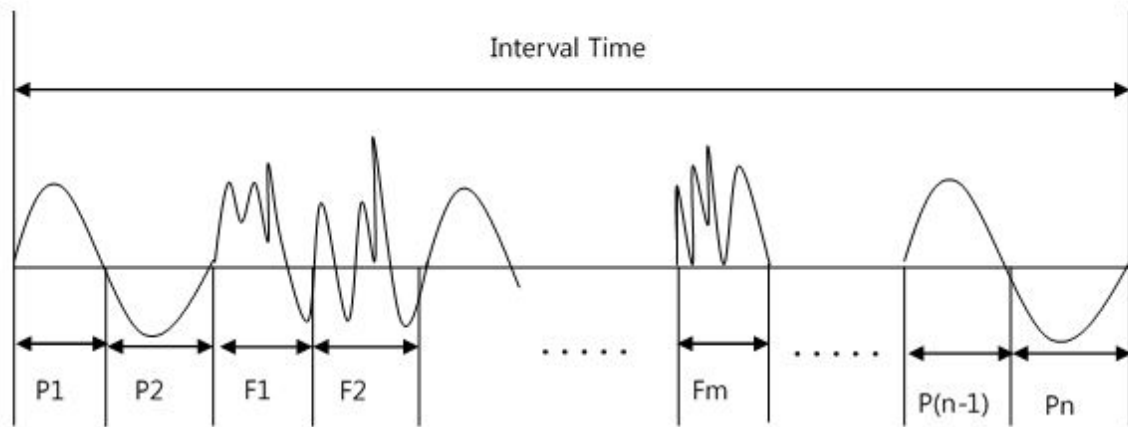
P1 ~ Pn: Regular Tone Signal
F1 ~ Fm: Error Tone Signal

$$RESULT(\%) = \frac{n}{n+m} \times 100$$

Appendix C.

Packet Data mode

(Since S/W Version 1.400)

C.1 Overview

The packet mode allows different data service components to be carried within the same sub-channel. The permissible data rates for the sub-channel shall be multiples of 8 kbps. Data may be carried in data groups (0, see clause 5.3.3) or transported using packets alone, Fig 1. The value of the DG flag (0, see clause 6.3.2) indicates which mode is used.
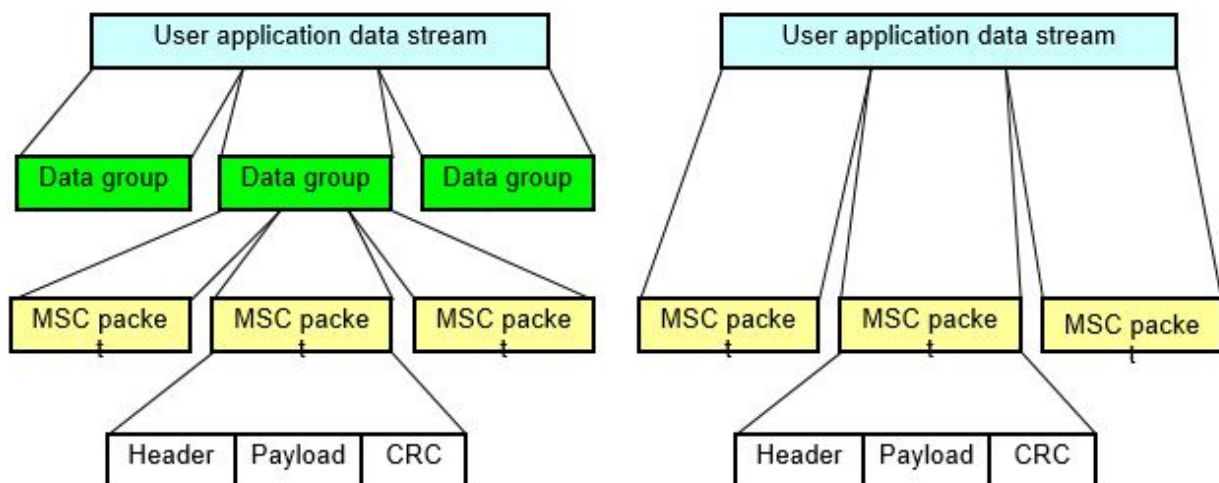
Figure C-1   Packet data with and without data groups

Within MSC sub-channel frame several packets from different applications can be transmitted at a time, [Figure 11]Sub-channel frame structure 2. Padding packets inserted if current packet do no fit in the space left in the sub-channel frame or when no application data available. However, **TC-2300A/B supports only one application per service component**.
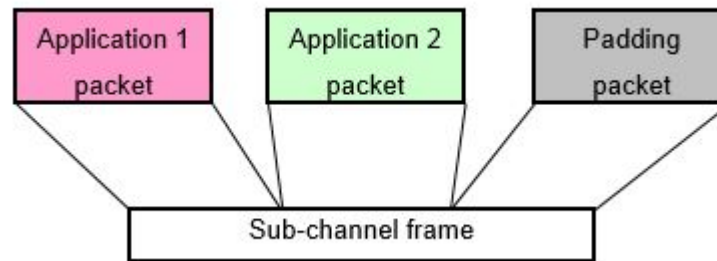
Figure C-2 Sub-channel frame structure

MSC data service in packet mode is allowed to have bit rate of multiples of 8 kbps. s frames are transmitted in 24 ms, sub-channel frame length for given bit rate **BR** (in units of kbps) can be found as follows:

$$FL = BR \times t = BR\left[\frac{kbit}{s}\right] \times t\left[\frac{s}{frame}\right] = BR\left[\frac{kbit}{s}\right] \times 0.024\left[\frac{s}{frame}\right] = 3 \times BR\frac{bytes}{frame}$$

For example, at bit rate of 32 kbps sub-channel frame length is 332=96bytes. Four packet lengths are defined: 24, 48, 72 and 96 bytes. So in s example sub-channel frame may carry four 24byte long packets, two 48byte long packet, two 24byte long packets and one 48byte long packet and so on.

packet beginning (either data or padding packet) must coincide with MSC sub-channel frame beginning. packet may not split between sub-channel frames.

C.2 Tester operation

TC-2300A/B ca transmit user supplied data file must contain properly formatted sequence of sub-channel frames. on program and tester esure that frames properly mapped into sub-channel. This application note explains te packet mode test using the tescom sample file. In this application note, the file is downloaded from PC to the TC2300A/B's internal memory through RS-232C data channel.

C.2.1 Application program settings

Select the "Packet" check box. If the data stream does not contain repetitions of the service, it is a good idea to check the "Repeat" option also. From the drop-down list located in the bottom part of the screen, select the appropriate bit rate of the service component.
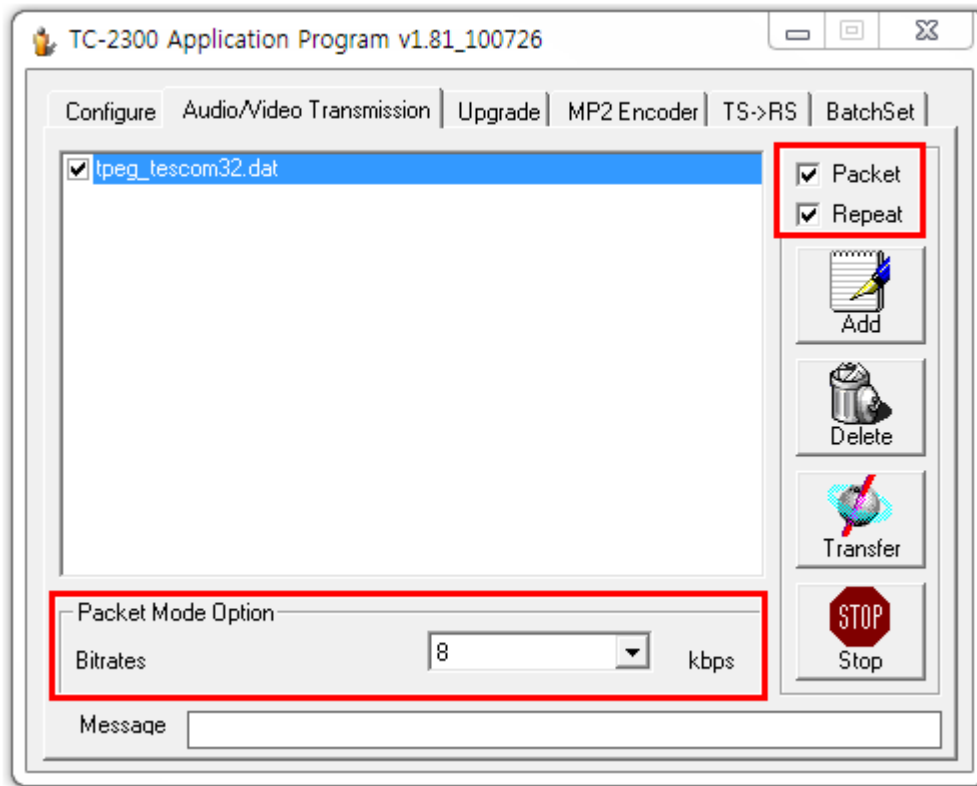
Figure C-3   Application program settings for packet mode

C.2.2 Tester settings

In the MCI screen for Service Component 1 (SC1) or Service Component 2 (SC2) select:

- SC1 TYPE or SC2 TYPE: PACKET.
- SC1_Data or SC2_Data: VIDEO_1, VIDEO_2 or VIDEO_3
- SC1_Ptype:EEP
- SC1eep_Lv: 3-A
- SC1eepBPS: according to prepared file.

Other settings are defined as follows.

DSCTy (Data Service Component Type)

should contain a decimal number describing the type of service. According to DSCTy types, the following settings are defined:

Table C-1 DSCTy types

Dec	DSCTy types
0	Unspecified data
1	Traffic message Channel (TMC)
2	Emergency Warning System (EWS)
3	Interactive Text Transmission System (ITTS)
4	Paging
5	Transparent Data Channel (TDC)
24	MPEG-2 Transport Stream, see [30]
59	Embedded IP packets
60	Multimedia Object Transfer (MOT)
61	Proprietary service: no DSCTy signalled
62	Not used
63	Not used

NOTICE

BWS uses DSCTy equal to 60 (MOT).

PktAddr

This field must contain the address used for data packet encoding.

DG(Data group flag)

Data group flag. ON if data groups are used. This must correspond to the settings of the user file encoding.

AppType

User Application type (see 0, clause 8.1.20). The following settings are currently defined:

Table C-2 User Application Types

User Application Type (hexadecimal)	User Application	Reference
0x000	Reserved for future definition	
0x001	Not used	
0x002	MOT Slideshow	TS 101 499 [22]
0x003	MOT Broadcast Web Site	TS 101 498 [21]
0x004	TPEG	
0x005	DGPS	
0x006	TMC	TS 102 368 [23]
0x007	EPG	TS 102 818 [24]
0x008	DAB	Java TS 101 993 [25]

User Application Type (hexadecimal)	User Application	Reference
0x009	DMB	TS 102 428 [31]
0x00a to 0x3ff	Reserved for future definition	
0x400 to 0x449	Reserved for proprietary applications	
0x44a	Journaline®	Fraunhofer IIS
0x44b to 0x7ff	Reserved for proprietary applications	

C.3 BWS Test

Download the BWS file into the TC2300A/B internal memory according to above explained procedure. Please go on Service Component 1(SC1) or Service Component 2(SC2) screen and set parameters as follows.

- SC1 TYPE or SC2 TYPE: PACKET.
- SC1_Data or SC2_Data: VIDEO_1, VIDEO_2 or VIDEO_3
- SC1_Ptype:EEP
- SC1eep_Lv: 3-A
- SC1eepBPS: according to prepared file.
- DSCTy: 60 (MOT)
- AppType: 3 (BWS)
- AppData: 1 (Basic Integrated Receiver)

NOTICE

AppData: Used to signal application specific information. The interpretation of these fields is determined by the user application as identified by the User Application Type. At present TC-2300A/B supports only one user application and user application data is limited to 1 byte, whose value is assigned by this setting.

For application type MOT BWS, user application data defines ProfileId as follows Table C-3 Registered BWS profiles:

Table C-3   Registered BWS profiles

ProfileId	Description	Specification reference
0x00	Reserved	
0x01	Basic Integrated Receiver	Profile see 7.2.1
0xFF	Unrestricted (PC)	Profile see 7.2.2

Built-in service component broadcasts BWS application. It consists of 3 web-pages:

Home	About	TC-2300A/B
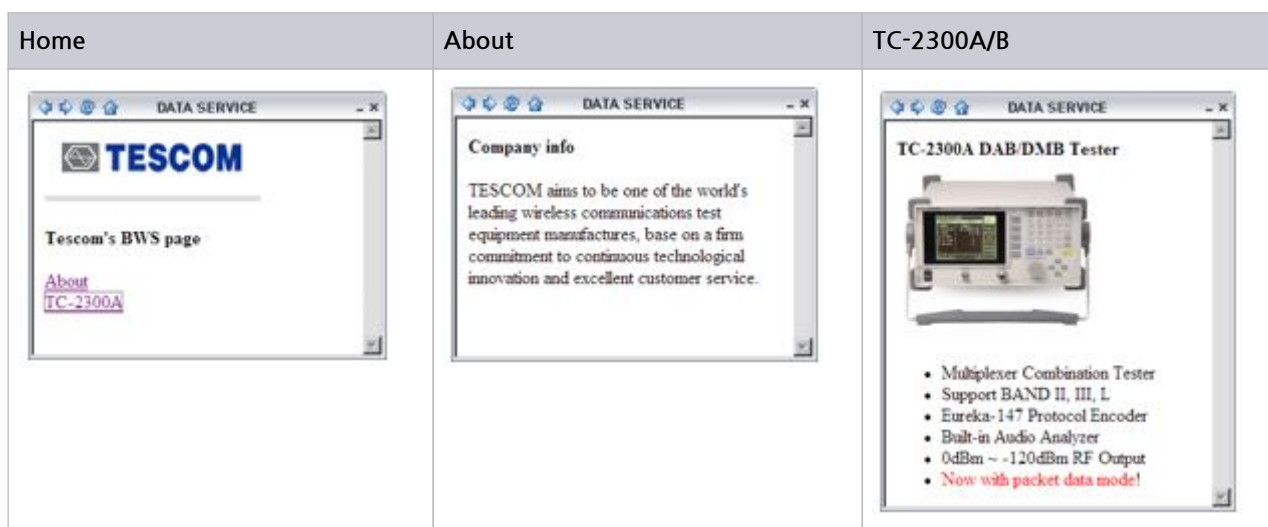
C.4 TPEG Test

Download the TPEG file into the TC2300A/B internal memory according to above explained procedure. Please go on Service Component 1(SC1) or Service Component 2(SC2) screen and set parameters as follows.

- SC1 TYPE or SC2 TYPE: PACKET.
- SC1_Data or SC2_Data: VIDEO_1, VIDEO_2 or VIDEO_3
- SC1_Ptype:EEP
- SC1eep_Lv: 3-A
- SC1eepBPS: according to prepared file. (32kbps for tescom TPEG file)
- DSCTy: 60 (MOT)
- AppType: 4 (TPEG)

Other settings are defined as default.

> **References**
>
> [1] ETSI EN 300 401: "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".
>
> [2] ETSI TS 101 756: "Digital Audio Broadcasting (DAB); Registered Tables".
>
> [3] ETSI TS 101 498-1: "Digital Audio Broadcasting (DAB); Broadcast website; Part 1: User application specification".

Appendix D.

DAB+ TEST

(Since S/W Version 1.600)

D.1 Overview

The DAB system standard defines the way that audio services are carried when using the MPEG Layer II. The new specification defines the way that audio services are carried when using MPEG 4 HE AAC v2.

Layer II audio permits two sampling rates, 48 kHz and 24 kHz. Each audio frame contains samples for 24 ms or 48 ms, respectively; and each contains the same number of bytes. The audio frames are carried in one or two, respectively, DAB logical frames. For AAC, two transforms are specified. For DAB, only the 960 transform is permitted with sampling rates of 48 kHz, 32 kHz, 24 kHz and 16 kHz. Each AU (audio frame) contains samples for 20 ms, 30 ms, 40 ms or 60 ms, respectively. In order to provide an architectural model similar to Layer II audio, and simple synchronization, the AUs are built into audio super frames of 120ms, which are then carried in five DAB logical frames. In order to provide additional error control, Reed Solomon coding virtual interleaving is applied. The overall scheme is shown in Figure D-1 Conceptual diagram of the outer coder and interleaver
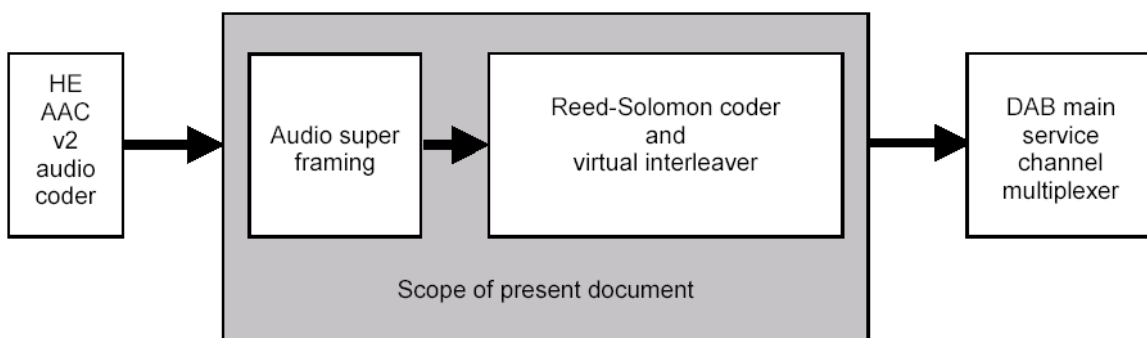

Figure D-1   Conceptual diagram of the outer coder and interleaver

The TC-2300A/B supports only the "DAB main service channel multiplexer" in Fig 1. So the AAC audio file, which is RS encoded and interleaved, should be downloaded to the TC-2300A/B's internal memory for DAB+ testing. The following section gives detailed information about the file downloading method and setting of the TC2300A/B.

D.2 File Download

For DAB+ testing, AAC audio should be downloaded to the TC-2300A/B's internal memory. This section explains how to download files to the TC-2300A/B.

D.2.1 Tester settings for file download

1. Connect the USB cable between the **VIDEO/AUDIO** port on the rear side of TC-2300B using the provided USB cable to the USB port of the PC.

⚠ **CAUTION**

    Please do check the specifications of a USB to RS-232C cable if it is not the one provided from TESCOM.

    * **Maximum Speed**: 921.6 kbps

    * Connector: DE-09P (DB-9 Male)

2. Press 〔Setup〕 **Setup** → 〔F3〕 **F3** and move to [FILE] menu.

3. Move to the Setup/FILE screen. Set the "TYPE" as AUDIO1 (AUDIO2 and AUDIO3 are two other possible choices).

4. Move the cursor to the "DOWNLOAD" parameters and Turn **DOWNLOAD** "ON". In this case, other keys don't operate.
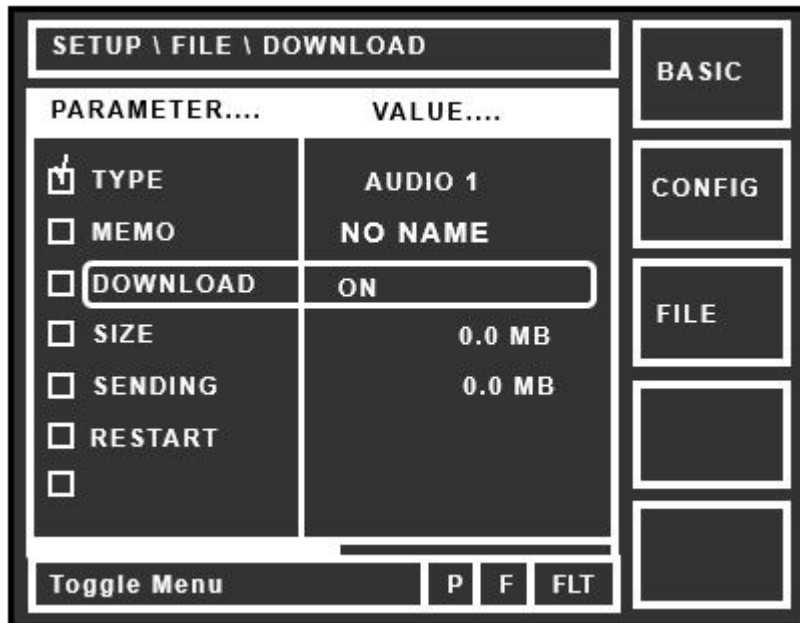

Figure D-2   Setting the TC-2300A/B's for file download

D.3 Application program settings

1. Execute TC-2300B Application Program on PC.

2. Select Audio/Video Transmission Tab and click "Add" icon to add the desired files to the file list.

3. Select the "Packet" check box.

4. From the drop-down list at the bottom of the screen, select the appropriate bit rate of the service component. If you are using the file which tescom provided, you can get the bit rate information from the file name. For instance, if you are using the "dap_p_96kbps.dat" file, the bit rate must be 96 kbps.

5. When the tester and the PC application program are set, click the "Transfer" icon to download the file to the TC-2300A/B's internal memory.
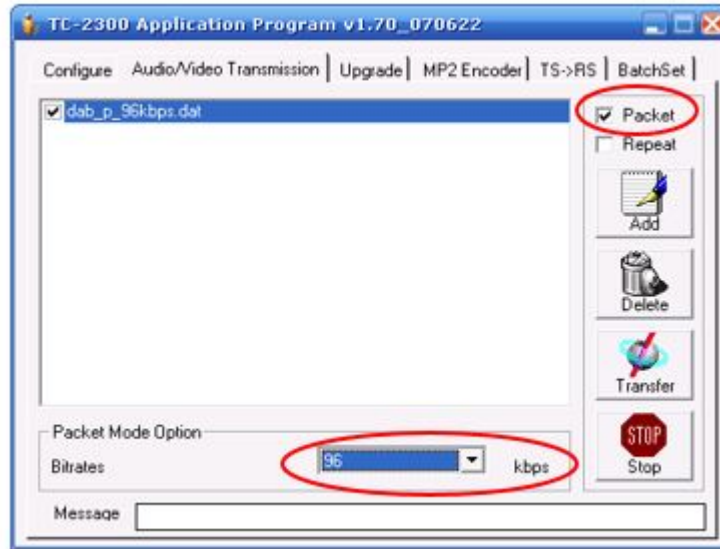
Figure D-3   User application settings

6. If file transmission starts, the size of file saved in SIZE and SENDING shall be displayed on GUI screen of TC-2300B at the real time.

7. If Data transmission ends, turn **DOWNLOAD** "OFF" on TC-2300B.

8. Some explanation of downloaded file could be added using "MEMO" parameter.

D.4 Tester Settings

On the MCI screen for Service Component 1 (SC1) or Service Component 2 (SC2), select:

- SC1 TYPE or SC2 TYPE: AUDIO
- SC1_Audio or SC2_Audio: AUDIO 1(AUDIO 2 and AUDIO 3 are two other possible choices)
- VERSION: DAB+
- BIT RATE: according to prepared file.(96 kbps for this example)

Other settings are the same as the reset state. Now everything is ready to test DAB+.
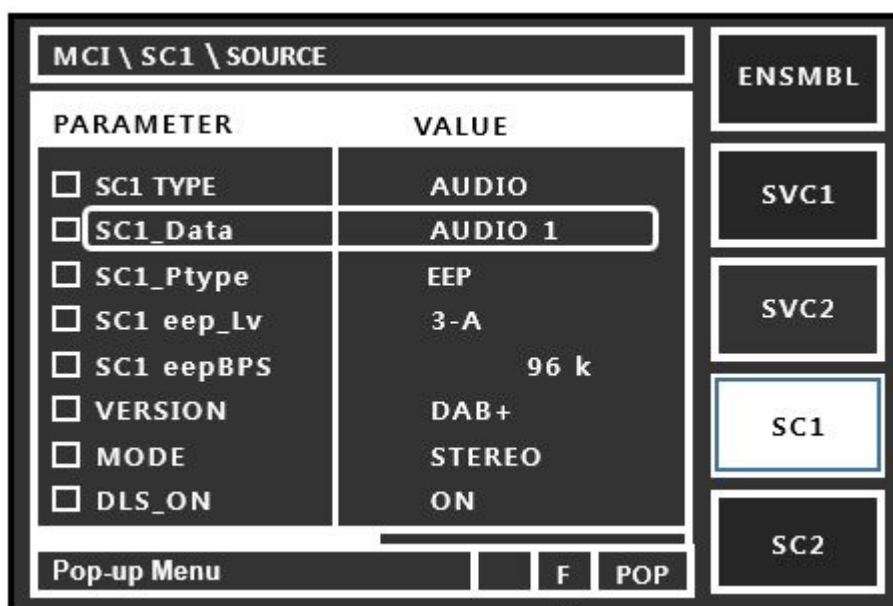
References

[1] ETSI EN 300 401: "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[2] ETSI TS 101 756: "Digital Audio Broadcasting (DAB); Registered Tables".

[3] ETSI TS 102 536: "Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio".

Appendix E.

ETI Test Solutions

(Since S/W Version 2.000)

E.1 Overview

The ETI file describes the characteristics of a signal suitable for transporting a full DAB Ensemble, comprising a number of sub-channels and a formatted Fast Information Channel (FIC), between the DAB Ensemble provider and the Transmission network provider. It means that if the ETI file is recorded specific broadcasting station's DAB/DMB signal, it contains all information about that station's. Using this file with the TC2300A/B's ETI function, that specific broadcasting station's DAB/DMB signal could be regenerated in the LAB.

Figure E-1 Conceptional DAB/DMB emission block diagram showing the location of the ETI is copied from ETS 300 401 [1] and shows the conceptual block diagram of the emission part of the DAB system. The conceptual location of the ETI is shown on the diagram.
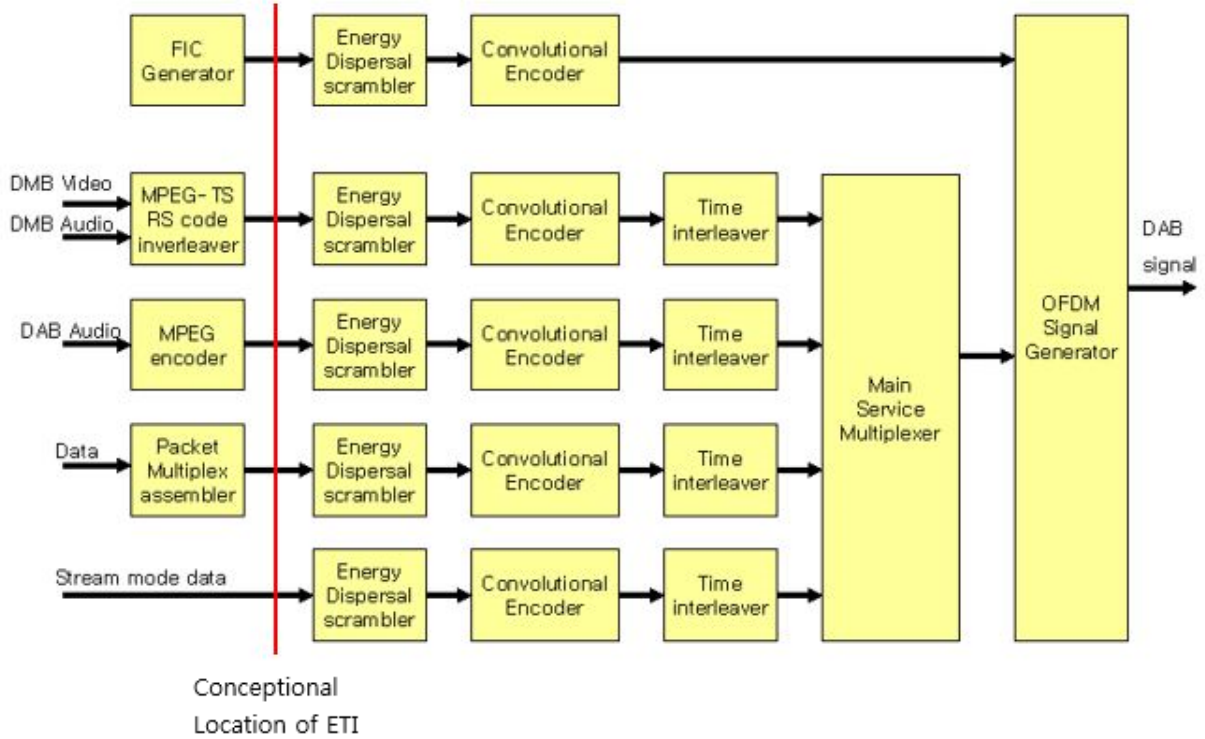
Figure E-1   Conceptional DAB/DMB emission block diagram showing the location of the ETI

E.2 File Download

To test using the ETI file, that ETI file must be downloaded to the internal memory of the TC2300A/B.

E.2.1 TC-2300A/B setting for file download

1. Connect the USB cable between the **VIDEO/AUDIO** port on the rear side of TC-2300B using the provided USB cable to the USB port of the PC.
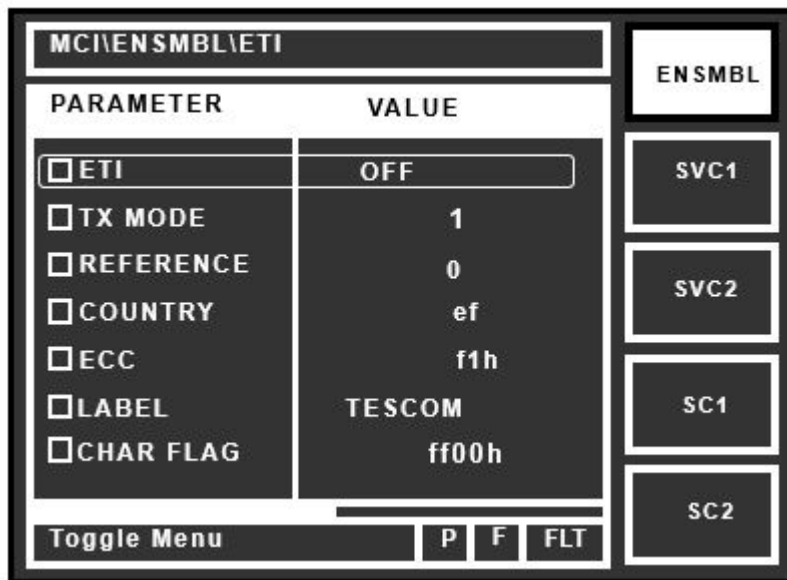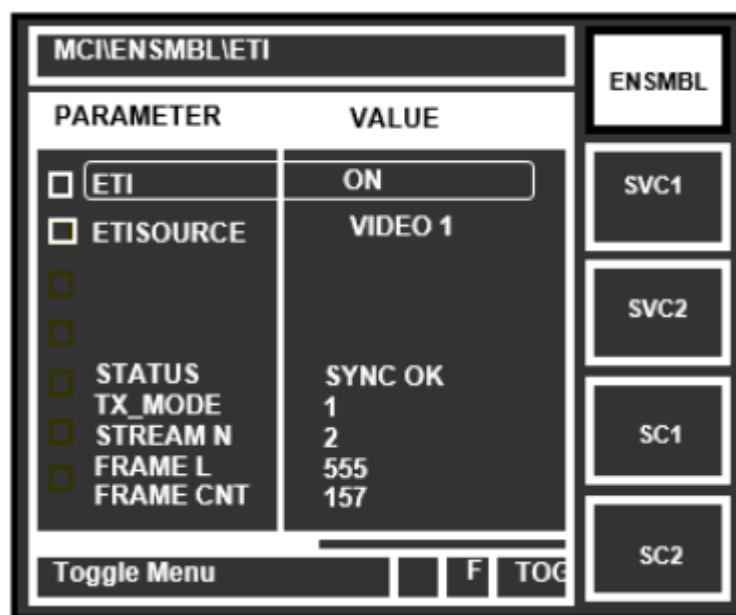
⚠ **CAUTION**

Please do check the specifications of a USB to RS-232C cable if it is not the one provided from TESCOM.

* **Maximum Speed**: 921.6 kbps

* Connector: DE-09P (DB-9 Male)

1. Move on 'MCI/ENSMBL' screen by pressing the F1 button.
2. Move the cursor to the 'ETI' parameter ('ETI' initial value set to OFF as follow)

3. Move on 'MCI/ENSMBL' screen and set the "ETI" parameter ON as follow.

⚠ **CAUTION**

   Always "ETI" to **ON** in the state , "ETI" file must be downloaded to the equipment .

4. Press 🔳 **Setup** → 🔳 **F3** and move to [FILE] menu.

5. Move on 'SETUP/FILE' screen and set VIDEO_1, VIDEO2, or VIDEO_3 the "TYPE" parameter. The figure below shows an example of the ETI download files to VIDEO 1.

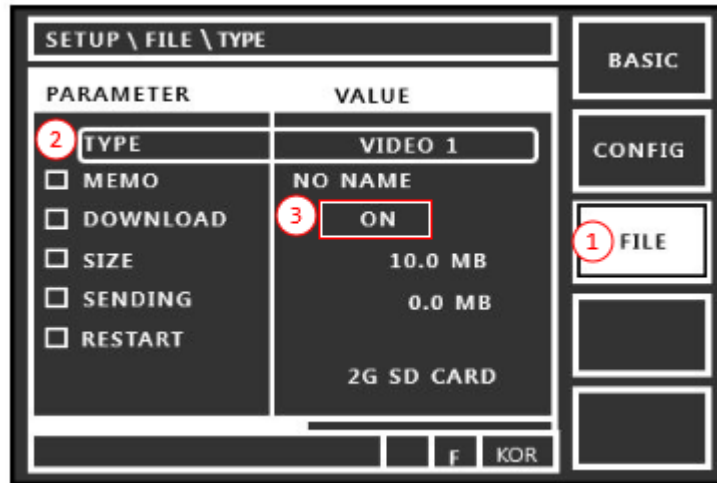6. Set the "DWONLOAD" parameter ON as follow.

Figure E-2   ETI file download screen

E.2.2 PC Application Program Setting

1. Execute TC-2300B Application Program on PC.

2. Select Audio/Video Transmission Tab and click "Add" icon to add the desired files to the file list.

3. Check the check box in front of desired file name from the listed ETI files and press "Transfer" button for transmission. During transmission, the proceeding status shall be displayed on the bar below.
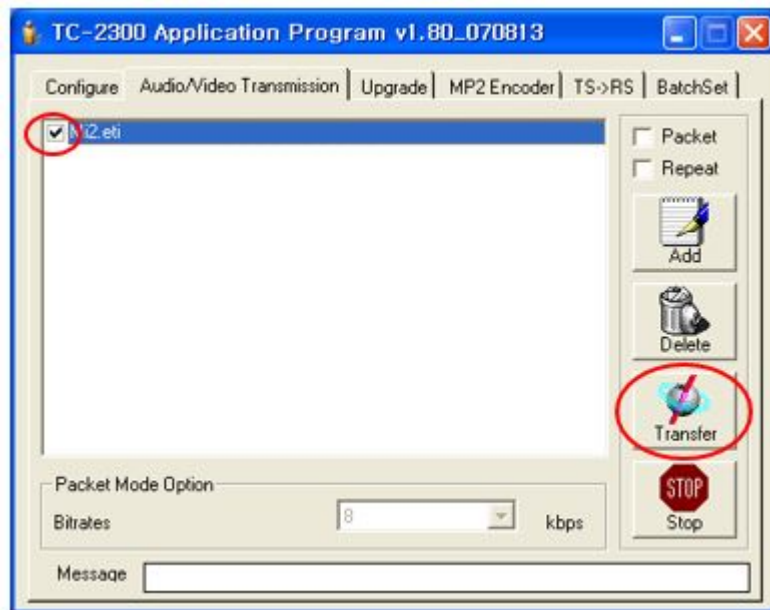
4. If file transmission starts, the size of file saved in SIZE and SENDING shall be displayed on GUI screen of TC-2300B at the real time.

5. If Data transmission ends, turn **DOWNLOAD** "OFF" on TC-2300B.

6. Some explanation of downloaded file could be added using "MEMO" parameter.

⚠ **CAUTION**

If there is some problem during downloading the file, the error message will be displayed on the TC2300A/B screen. In this case, please check the RS-232C cable condition and try again.

* **Maximum Speed**: 921.6 kbps
* Connector: DE-09P (DB-9 Male)

E.3 Tester setting for ETI test

After download the ETI file, move on 'MCI/ENSMBLE' and set the "ETI" parameter ON after OFF. Set the proper RF frequency and power and test using the DUT.
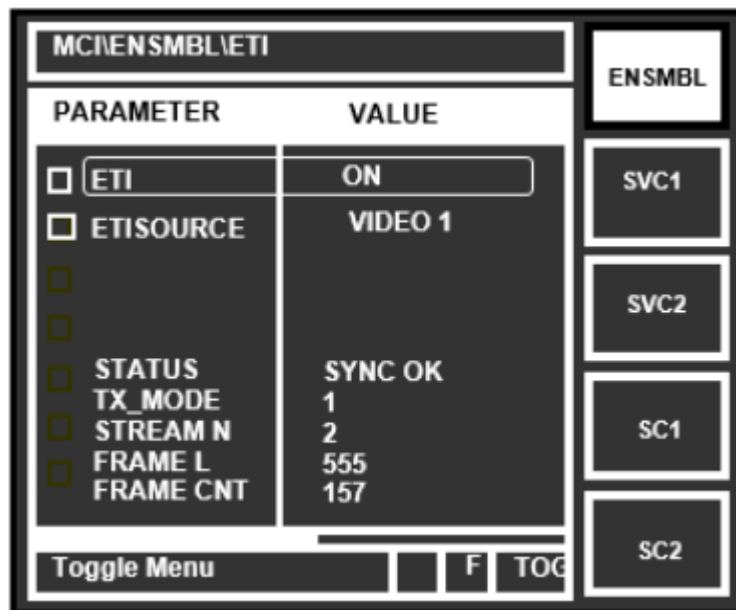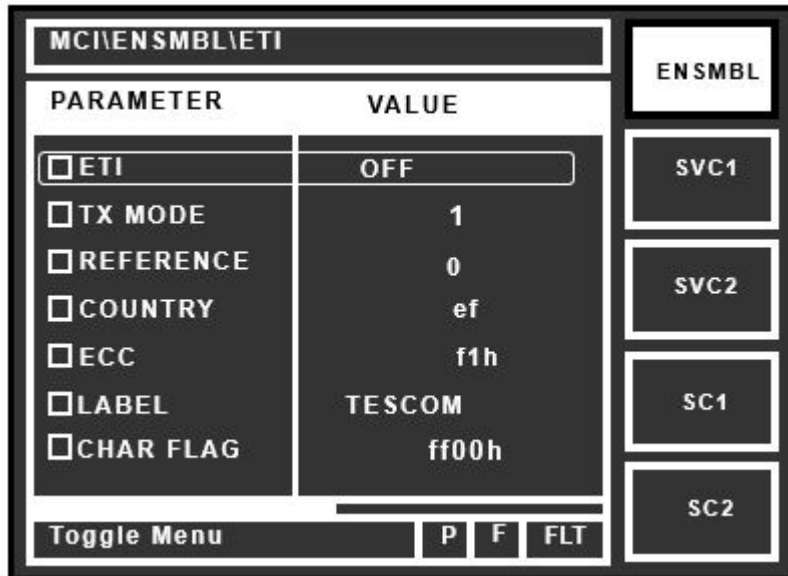
⚠ CAUTION

ETI SOURCE is possible to select only those files which are saved in VIDEO 1 ~ VIDEO 3. "ETI EXTERNAL" file transfer function is not supported.

❝ References

[1] ETSI EN 300 401: "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[2] ETS 300 799: "Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface (ETI)".