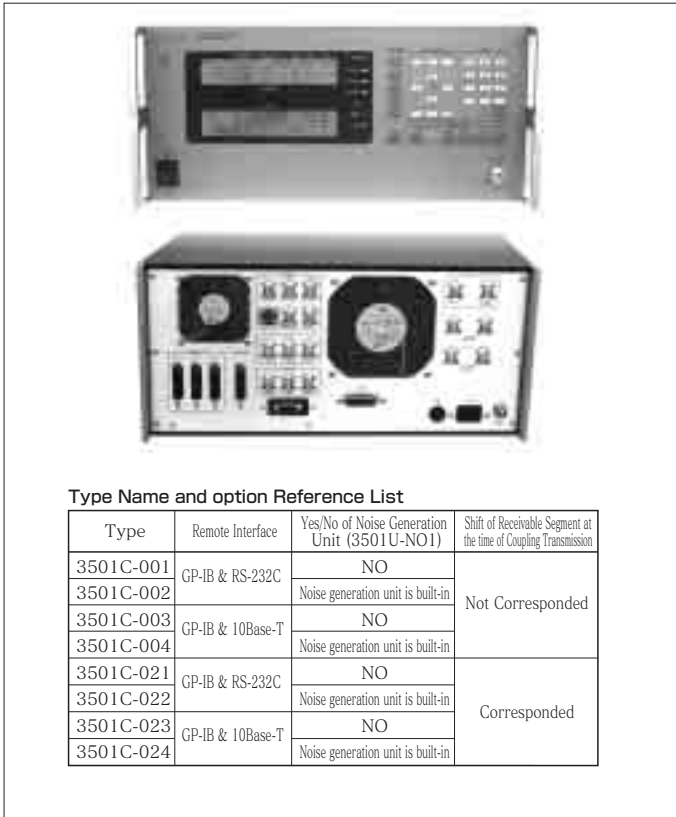


3501C

OFDM MODULATOR (ISDB-T TERRESTRIAL DIGITAL TELEVISION/ISDB-T_{SB} TERRESTRIAL SOUND BROADCASTING SYSTEM)



Type Name and option Reference List

Type	Remote Interface	Yes/No of Noise Generation Unit (3501U-NO1)	Shift of Receivable Segment at the time of Coupling Transmission
3501C-001	GP-IB & RS-232C	NO	Not Corresponded
3501C-002		Noise generation unit is built-in	
3501C-003	GP-IB & 10Base-T	NO	
3501C-004		Noise generation unit is built-in	
3501C-021	GP-IB & RS-232C	NO	Corresponded
3501C-022		Noise generation unit is built-in	
3501C-023	GP-IB & 10Base-T	NO	
3501C-024		Noise generation unit is built-in	

General

This unit is terrestrial digital broadcasting signal generator corresponding to transmission route coding system regulated by "The technical condition of terrestrial digital television broadcasting system" (ISDB-T system) and "The technical condition of terrestrial digital sound broadcasting system" (ISDB-T_{SB} system) in "The technical condition relating to digital broadcasting system" that are the part of Telecommunication Technology Deliberative Assembly Consultation No.74.

Transmission route coding process of ISDB-T (ISDB-T_{SB}) is made for MPEG2 transport stream (MPEG2 TS) input to each layer and OFDM wave of 13 segments band of ISDB-T system, and 1 segment band and 3 segments band of ISDB-T_{SB} are possible to output as RF broadcasting signal of center frequency of 30MHz ~ 1000MHz by built-in synthesized frequency up-converter through OFDM framing, inverse FFT, orthogonal modulation and IF frequency conversion. (Also, corresponding to broadcasting TS).

Especially, TS re-multiplexing circuit is equipped, so that tests for transmission route and receiver operation of each layer are possible without providing external re-multiplexer. Noise generation unit is built-in, so that simplification of BER measurement against C/N is possible.

By connecting with Eiden's 4408A/4401A Fading Simulator, simulation of transmission characteristic and evaluation for receiver under multi-path disturbance are possible.

By configuring terrestrial digital broadcasting measuring system with combination of Eiden's Digital Transmission Tester 7705A/7706A (Receiving part), several measurements, such as BER measurement, reception characteristic of layer transmission and etc. become possible.

Features

- Corresponding to Mode1, Mode2, Mode3, guard interval rate of 1/4, 1/8, 1/16 and 1/32 of both ISDB-T system and ISDB-T_{SB} system.
- Possible to generate signal corresponding to partial reception by using A layer.
- Possible to input TS data to each layer individually as having 3 layer process portions (A, B, C). In case of the usage for ISDB-T system, 3 TS inputs to layer A, B and C are possible individually and in case of the usage for ISDB-T_{SB} system, 2 TS inputs to layer A and B are possible individually. Layer multiplexing by this unit only is possible easily.
- Each transmission parameter, such as carrier modulation scheme (DQPSK, QPSK, 16QAM, 64QAM), convolution coding rate (1/2, 2/3, 3/4, 5/6 and 7/8), time interleave length and number of segment can be set for each layer.
- Possible to select interface of DVB parallel (DVB-SPI) or ASI interface for TS data.
- Possible to select input of packet length of 188 bytes configuration (MPEG 2 transport MUX packet) or packet length of 204 bytes configuration (packet with 16 bytes dummy) for input format. (Manual selection and automatic recognition)
- Equipping output terminal of clock approximated rate of information bit rate of each layer (= number of segment of each layer x number of transmitting

TSP × 188 × 8 × 1/frame length). Also, possible to generate clock approximated to packet rate of input packet length of 204 bytes configuration.

- Corresponding to also re-multiplexed TS signal input and broadcasting TS signal input besides TS input of each layer.
- Equipping function to pass each process of Reed-Solomon, energy dispersion, bit interleave, byte interleave, time interleave and frequency interleave individually.
- Equipping independent PN signal generator ($g(x) = X^{23} + X^{18} + 1$: Reverse output and $g(x) = X^{15} + X^{14} + 1$: Reverse output) at TS multiplexing part and carrier modulation part for each layer, so that error rate measurement before/after Viterbi correction and RS correction for each layer is possible.
- Possible to generate 13 segments format of ISDB-T system (Wide band OFDM signal), and 1 segment independent format and 3 segments independent format of ISDB-T_{SB} system (Narrow band OFDM signal). Also, at the time of narrow band OFDM signal generation, possible to generate coupling transmission test signal for evaluation for 6MHz band (13 segments coupling) and 4MHz band (8 segments coupling).
- Also, on "Model corresponding to shift of receivable segment at the time of coupling transmission (3501C-02□)", possible to shift of receivable segment to voluntary position in coupling transmission test signal (Option).
- Equipping synthesized frequency up-converter capable to set wide range output frequency of 30MHz ~ 1000MHz, possible to designate using channel by channel pre-set function and to set output frequency setting manually in 0.1Hz step. Channel pre-set function can output modulated RF signal on desired channel by designating each channel number of VHF/UHF / CATV band. At that time, ON/OFF of 1/7MHz offset is possible.
- Possible to vary RF output level in the range of +10dBm ~ -89dBm (Wide band OFDM signal) in step of 0.01dB. Possible to obtain stable output level by average AGC function (ON/OFF is possible).
- Possible to obtain precise transmission frequency by input of system clock of 512/63MHz (8.127...MHz) and 10MHz frequency reference from external.
- Equipping inverse function for modulation carrier arrangement.
- Possible to generate CW corresponding to modulation center frequency f_0 .
- Equipping ON/OFF function for carrier of voluntary segment.
- Equipping monitor output of digital modulated wave (Center frequency of 8.127...MHz).
- Equipping input/output terminal of IF signal (Center frequency is 37.15MHz). IF input/output is connected on rear panel by connector.
- Equipping input/output terminal of 2nd IF signal (Center frequency is 287.15MHz).
- 2nd IF input/output is connected on rear panel by connector, and possible to connect with Eiden's 4408A/4401A Fading Simulator.
- Noise Generation Unit (Model: 3501U-NO1) is built-in, so that BER measurement against C/N can be done easily.
- Operation is done easily by liquid crystal display on panel.
- Equipping GP-IB interface and RS-232C interface for controlling as the standard. Possible to change RS-232C to 10Base-T (Option).

Composition

Main Unit	1
Dimensions	425(W) × 199(H) × 580(D) mm (Excluding projections)
Weight	Approx. 28 kg
Accessories	
Power Cable (Including 3pin → 2pin converter)	1
Rack Mount Adapter	1 set
Instruction Manual and Test Result Sheet	1
Remote Utility	1
Power Source	
Input Voltage Allowable Range	: AC90V ~ AC250V (50Hz/60Hz)
Power Consumption	: Approx. 180VA
Operating Environment	
Temperature	: + 5°C ~ + 40°C
Humidity	: 45% ~ 85%RH (No dew generation)

Rating

• Parallel Data Input

Dsub-25pin (Female, 4-#40UNC Inch size screw) 3 routes (LAYER A ~ C). TS parallel data input of each layer.

In case of usage for ISDB-T system broadcasting test, LAYER A ~ C routes are possible to use, and in case of usage for ISDB-T_{SB} system broadcasting test, LAYER A and B are possible to use.

DVB parallel interface (DVB-SPI)

(Other than TS input of each layer, corresponding to broadcasting TS input.)

• Serial Data Input

BNC-R 3 routes (LAYER A ~ C)

TS serial data input for each layer.

In case of usage for ISDB-T system broadcasting test, LAYER A ~ C routes are possible to use, and in case of usage for ISDB-T_{SB} system broadcasting test, LAYER A and B are possible to use.

ASI interface (DVB ASI)

(Other than TS input of each layer, corresponding to broadcasting TS input.)

• AC1/AC2 Input

Dsub-25pin (Female, 4-#40UNC Inch size screw) 1 route
 Input of additional information (Auxiliary Channel).
 Input Level: LVDS (Conforming to TIA/EIA-644)

• 10MHz Input

BNC-R 1 route
 Frequency reference input. With function to switch internal/external.
 Input Level : 0dBm ± 5dB
 Input Frequency Accuracy : Within $\pm 1 \times 10^{-6}$
 Impedance : 50 Ω

• SYSTEM Clock Input

BNC-R 1 route
 Clock input synchronized with input TS data (512/63MHz \div 8.127...MHz).
 With function to switch internal/external.
 Input Level : TTL
 Input Frequency Accuracy : Within $\pm 1 \times 10^{-6}$
 Impedance : 50 Ω

• TS Clock Output

BNC-R 3 routes
 Clock approximated to following bit rate is output to each layer.
 1) When 188 bytes packet configuration is selected.
 Clock approximated to frequency of information bit rate regulated by number of segment of subject layer \times number of transmission TSP \times 188 bytes \times 8 bits \times 1/frame length is output.
 2) When 204 bytes packet configuration is selected.
 Clock approximated to frequency of rate calculated by number of segment of subject layer \times number of transmission TSP \times 204 bytes \times 8 bits \times 1/frame length is output.
 In case that internal re-multiplexing function of this unit is not used, 2048/63MHz is output.

Output Level : TTL
 Impedance : 50 Ω

• Digital Modulation Monitor Output

BNC-R 1 route
 Digital modulation stage output (Center frequency is 512/63MHz \div 8.127...MHz)
 Output Level : -10dBm
 Impedance : 50 Ω

• IF Input/Output

BNC-R 1 route
 Output and input of IF stage (Center frequency is 37.15MHz).
 Input/Output is connected by U link (BNC-UPA) normally.
 ※Modulation carrier arrangement at IF output is inverted against RF output.
 Input/Output Level : -10dBm
 Impedance : 50 Ω

• 2nd IF Input/Output

BNC-R 1 route
 Output and input of 2nd IF stage (Center frequency is 287.15MHz).
 Input/Output is connected by U link (BNC-UPA) normally.
 ※Modulation carrier arrangement at 2nd IF output is inverted against RF output.
 Input/Output Level : -12dBm
 Impedance : 50 Ω

• MASTER Clock Output

BNC-R 1 route
 MASTER clock output of internal digital process (4096/63MHz \div 65MHz).
 Output Level : TTL
 Impedance : 50 Ω

• SAMPLE Clock Output

BNC-R 1 route
 Clock of same rate with FFT sample clock of ISDB-T system (Wide band OFDM signal) is output (512/63MHz \div 8.127...MHz).
 Output Level : TTL
 Impedance : 50 Ω

• SYMBOL Clock Output

BNC-R 1 route
 Timing clock equivalent to symbol cycle after adding guard interval of ISDB-T system and ISDB-T_{SB} system (Narrow band OFDM signal) is output.
 Output Level : TTL
 Impedance : 50 Ω

• FRAME Clock Output

BNC-R 1 route
 Timing clock equivalent to frame cycle after adding guard interval of TSDB-T system and ISDB-T_{SB} system (Narrow band OFDM signal) is output.
 Output Level : TTL
 Impedance : 50 Ω

• RF Output

N-R 1 route
 Frequency Setting Range : 30MHz ~ 1000MHz
 Frequency Setting Resolution : 0.1Hz
 Level Setting Range : +10dBm ~ -89dBm by RF power meter

※But, when noise is added, output becomes Max. -10dBm.

※But, under connecting mode of Eiden's 4408/4401A Fading Simulator, output becomes Max. 0dBm.

Level Setting Resolution : 0.01dB
 Impedance : 50 Ω
 Modulation Wave Band Width : 428.57...kHz (1 seg Mode)
 1.28...MHz (3 seg Mode)
 5.57...MHz (13 seg Mode)

AGC Function : Average. AGC OFF (MGC mode) function is provided.

• Each Characteristic of RF Converter Part

Output Frequency Accuracy : Within $\pm 1 \times 10^{-6}$ against setting frequency.
 When external frequency reference is used, depending on its frequency accuracy.

Frequency Response within Band : Within ± 0.5 dB (BW : 8MHz)

2-signal 3rd Distortion (1M3) : Less than -55dB

Spurious (Harmonics) : Less than -60dB

※But, excluding at the time of generation of modulation center frequency less than $f_0=93$ MHz (J-1ch).

Spurious Non-harmonics : Less than -60dB

C/No : Less than -130dBc/Hz

Output Level Accuracy : At CW output for 13 segments.

Output Level Setting Value	Accuracy: AGC ON	Accuracy: AGC OFF
+10dBm ~ -10dBm	Less than ± 1.0 dB	Less than ± 2.0 dB
-10dBm ~ -30dBm	Less than ± 1.5 dB	Less than ± 2.5 dB
-30dBm ~ -89dBm	Less than ± 2.0 dB	Less than ± 3.0 dB

• GP-IB

GP-IB Connector 1 route
 For control. : Conforming to IEEE 488.
 Input/Output : Conforming to IEEE 488.

• RS-232C

Dsub-9pin (Female, 4-#40UNC Inch size screw) 1 route
 For control. : Conforming to IEEE 488.
 Asynchronous
 Communication Speed : 19200 bps
 Data Length : 8 bits
 Stop Bit : 1 bit
 Parity : No

• 10 Bass-T

RJ-45 Type 1 route
 For control by LAN [Option]
 Input/Output : Conforming to IEEE802.3.

※This is selection either RS-232C interface or this.

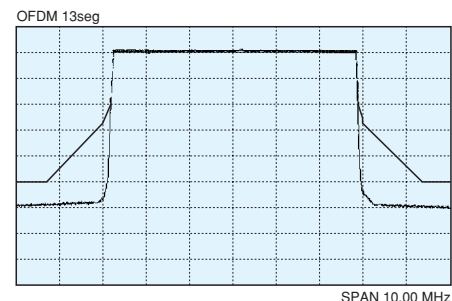
(Under remote control, if unit is used for a long time by switching setting frequently, please consult with Eiden separately.)

• Noise Generation Unit [Type Name: 3501U-NO1]

Following regulation is on the assumption to add noise on IF signal of this unit.
 ※Restricted Item

- 1) In case of usage by input of external signal for IF, regulation of noise setting is not fulfilled.
- 2) At the time of noise adding, RF output level is limited to -10dBm Max.
 C/N Setting Range : -5 ~ +40dB
 C/N Accuracy : ± 0.1 dB Typ. under the condition of environmental temperature of 25°C and C/N setting is +5dB ~ +30dB.
 Under setting condition and environmental condition other than the above, ± 0.5 dB Max.

Setting Resolution : 0.1dB
 C/N Setting Band Width : 430kHz ~ 10MHz BW
 Band Width Resolution : 0.01MHz



Spectrum Characteristic
 485MHz 13Segments Mode 1