MULTI-SYSTEM DIGITAL SIGNAL GENERATOR 3535A

(Corresponded to DVB-T, DVB-H, DVB-C, DVB-S, DVB-S2, ATSC, ITU-T J.83B)

General

This unit is all in one digital signal generator that can be output digital modulated wave of DVB-T/H system (Terrestrial: COFDM modulation), DVB-C system (Cable: QAM modulation), DVB-S system (Satellite: QPSK modulation), DVB-S2 (Satellite: PSK, APSK modulation) of Europe digital broadcasting standard and ATSC system of U.S.A. digital broadcasting standard (Terrestrial: 8VSB modulation), and ITU-T J.83B system (Cable: QAM modulation) by selection.
TS signal generator of HDD type and noise signal generator are built-in, so that picture evaluation test is possible by only this unit. Also, by using Eiden's transmission tester (7705A, 7706A, 7708A), BER measurement in TS packet format is possible.

Features

●Various digital modulated signal are output by selection.

Digital modulated wave of DVB-T (Terrestrial: COFDM modulation: BDW 6,7 and 8MHz), DVB-H (Terrestrial: COFDM modulation: BDW 5,6,7 and 8MHz), DVB-C (Cable: QAM modulation), ATSC (Terrestrial: 8VSB modulation), ITU-T J.83B system (Cable: QAM modulation), DVB-S (Satellite: QPSK modulation) and DVB-S2 (Satellite: PSK, APSK modulation) can be output by selection. (Output is 1 route)

●Corresponded to DVB-T/H layer transmission option as standard.

This Unit equips EN300.744 layer transmission option.

●Modulation parameter setting function

Modulation parameters in each system can be changed.

●Frequency setting function

Output center frequency can be set 30～1000MHz (1Hz step) for DVB-T/H, DVB-C and ATSC, ITU-T J.83B system and 950～2150MHz (10kHz step) for DVB-S/S2.

●RF output level setting function

Output level can be varied in range of **-110～+17dBm in step of 0.1dB** for DVB-T/H, DVB-C and ATSC, ITU-T J.83B system, and in range of **-110～+10dBm in step of 0.1dB** for DVB-S/S2 system.

●Noise Signal generating function

Setting of noise signal ON/OFF and C/N is possible. Setting range of C/N is 0～40dB for DVB-T/H, DVB-C, ATSC and ITU-T J.83B system, and 0～30dB for DVB-S and DVB-S2 system. Also, min. resolution is 0.1dB.

●TS generators of 2 routes are built-in

2 routes of independent TS generator are equipped as the standard, so that 2 kinds of TS can be output simultaneously. TS data recorded on built-in hard disk (250Gbytes) or built-in flash memory (2Gbytes x 2) or external USB memory (2Gbytes x 2) can be reproduced. Data transfer to built-in hard disk or built-in flash memory can be made through DVD-ROM drive or external USB memory or ETHERNET terminal.

●IF output function

Input/Output terminals for 44MHz IF signal are equipped for DVB-T/H, DVB-C, ATSC and ITU-T J.83B system. Expansion to fading wave generating system is possible by connecting Eiden's Fading simulator (4409A, 4410A)

●Synchronization with external 10MHz is possible.

Synchronization of digital signal processing part and RF frequency coverting part of this unit with external 10MHz as reference signal is possible.
※Except DVB-S and DVB-S2

●Impedance converter for RF output is built-in.

Impedance converter converting impedance of RF output terminal to 75Ω is built-in. By connecting 50Ω RF terminal on rear panel with U-link, signal can be output from 75Ω RF terminal on front panel.

●PRBS generating function

Generation of PRBS in modulator is possible for BER measurement.
($2^{23}-1$, generating polynomial $X^{23}+X^{18}+1$)

●Remote control function

Remote control by GP-IB(IEEE-488.2) or ETHERNET(10Base-T/100Base-TX) is possible.

Composition

Main unit ··1
Dimensions 425(W)×149(H)×580(D)mm (Excluding projections)
Weight Approx. 17.5kg
Accessories
Power Cable (Including 3pin→2pin Converter) ·······1
Instruction Manual/Quality Assurance Sheet ·······1
USB Flash Memory (2Gbytes) ····················2
Note) No guarantee for operation of memory other than attached one.
Power Source Input Voltage Allowable Range: AC90V～AC250V(50Hz/60Hz)
Power consumption: Approx. 200 VA
Operating Environment
Temperature: +5℃～+40℃
Humidity: Less than 90%RH (No dew generation)

Type List

Type	Built-in System
3535A-002	DVB-T / DVB-S / DVB-C/ ATSC / ITU-T J.83B
3535A-012	ATSC / ITU-T J.83B
3535A-122	DVB-T / DVB-H / DVB-C
3535A-032	DVB-T / DVB-C / ATSC / ITU-T J.83B
3535A-222	DVB-T / DVB-C / DVB-S / DVB-S2
3535A-302	DVB-T / DVB-H / DVB-C / DVB-S / DVB-S2 / ATSC / ITU-T J.83B

Rating

・Input Terminal

TS Input Terminal

Panel Indication	Content
【TS INPUT1(HP) / ASI(75Ω) [TERRESTRIAL] 】 【TS INPUT2(LP) / ASI(75Ω) [TERRESTRIAL] 】	Input for DVB-T/H、ATSC、DVB-C
【TS INPUT / ASI(75Ω) [SATELLITE] 】	Input for DVB-S/S2 (Only item including DVB-S/S2)

・Connector/Impedance : BNC-R / 75Ω
・Signal Format :Conforming to DVB-ASI

Note) 【TS INPUT2(LP) / ASI(75Ω)】terminal can be used as only LP (Low Priority) input in layer transmission mode of DVB-T/H system.

IF Input Terminal【IF INPUT】

・Connector/Impedance: BNC-R / 50Ω
・Input Center Frequency & Level:
44MHz / −10dBm (Standard value)

Note) Terminal for DVB-T/H, DVB-C, ATSC, ITU-T J.83B.
Normally connection of IF output terminal is made with attached U-link.

10MHz Reference Input Terminal【10MHz INPUT】

・Connector/Impedance: BNC-R / 50Ω
・Input Frequency & Frequency Range: Within10MHz±50Hz
・Input Level: Within 0dBm±3dB

Note) Input terminal for external frequency reference.

・Output Terminal

TS Output Terminal【TS OUTPUT1 / ASI】,【TS OUTPUT2 / ASI】

・Connector / Impedance: BNC-R / 75Ω
・Signal Format: Conforming to DVB-ASI
・Output Rate: 0.1～90Mbps

Note) In case that 2 routes simultaneous reproduction is made from memory drive, use it in range not exceeding 90Mbps that are total value of each output rate.

IF Output Terminal 【IF OUTPUT】

・Connector / Impedance: BNC-R / 50Ω
・Output Center Frequency & Level: 44MHz / −10dBm
(At noise OFF, standard value)

Note) Terminal for DVB-T/H, DVB-C, ATSC, ITU-T J.83B.
Also, normally, connection of IF input terminal is made with attached U-link.

RF Output Terminal (Front Panel) 【RF OUTPUT / MAX +17dBm】

・Connector / Impedance: BNC-R / 75Ω

Note) Output of rear panel output through built-in impedance converter.

RF Output Terminal (Rear Panel)【RF OUTPUT / MAX +17dBm】

・Connector / Impedance: BNC-R / 50Ω
・Output Center Frequency: 30～1000MHz, variable in step of 1Hz
(DVB-T/H、DVB-C、ATSC、ITU-T J.83B system)
: 950～2150MHz, variable in step of 10kHz
(DVB-S/S2 system)
・Output Signal Level: −110～+17dBm, variable in step of 0.1dB
(DVB-T/H、DVB-C、ATSC、ITU-T J.83B system)
−110～+10dBm, variable in step of 0.1dB(DVB-S/S2 system)

10MHz Reference Output Terminal 【10MHz OUTPUT】

・Connector / Impedance: BNC-R / 50Ω
・Output Frequency Accuracy: Within 10MHz±1×10^{-6}
(When internal 10MHz reference is used)

Note) When external frequency reference is used, accuracy is depending upon its frequency accuracy.

・Output Level: Within 0dBm±3dB Note) Output terminal of frequency reference signal (10MHz)

・Remote Interface

GPIB Interface【GP-IB】 : Conforming to IEEE-488.2
ETHERNET Interface【ETHERNET】: 10Base-T/100Base-TX(Auto negotiation)

・Drive and Interface for TS Data Reproduction and storage

・Built-in Hard Disk Drive (Removable type: 250Gbytes)
・Built-in Flash Memory Drive (2Gbytes x 2)
・USB Interface (USB-A :2 routes, Conforming to USB2.0 Hi-speed)
By connecting external USB memory drive or external hard disk drive, reproduction or transfer (copy) of TS data is made.

Main Parameters of Each System

Main Parameters of DVB-T

	DVB-T(6MHz)	DVB-T(7MHz)	DVB-T(8MHz)
COMPLIANT	EN300.744		
MAX TS RATE(188Byte)	23.75Mbps	27.70Mbps	31.66Mbps
MAX TS RATE(204Byte)	25.77Mbps	30.06Mbps	34.36Mbps
RANDOMIZATION	$1+X^{14}+X^{15}$		
OUTER CODING	RS(204,188,t=8)		
INTERLEAVING	Convolutional interleaving depth I=12		
CODE RATE	1/2,2/3,3/4,5/6,7/8		
FFT SIZE	2K,8K		
GUARD INTERVAL	1/4,1/8,1/16,1/32		
CONSTELLATION	QPSK,16QAM,64QAM		
ALPHA	1,2,4		
MODULATION	COFDM		

Main Parameters of DVB-H

	DVB-H(5MHz)	DVB-T(6MHz)	DVB-T(7MHz)	DVB-T(8MHz)
COMPLIANT	EN300.744			
MAX TS RATE(188Byte)	19.79Mbps	23.75Mbps	27.70Mbps	31.66Mbps
MAX TS RATE(204Byte)	21.47Mbps	25.77Mbps	30.06Mbps	34.36Mbps
RANDOMIZATION	$1+X^{14}+X^{15}$			
OUTER CODING	RS(204,188,t=8)			
INTERLEAVING	Convolutional interleaving depth I=12			
CODE RATE	1/2,2/3,3/4,5/6,7/8			
FFT SIZE	2K,4K,8K			
GUARD INTERVAL	1/4,1/8,1/16,1/32			
CONSTELLATION	QPSK,16QAM,64QAM			
ALPHA	1,2,4			
MODULATION	COFDM			

Main Parameters of DVB-S2

	DVB-S2
COMPLIANT	EN302.307
MAX TS RATE(No Pilot)	80.48753463Mbps
MAX TS RATE(Pilot)	78.57220119Mbps
RANDOMIZATION	$1+X^{14}+X^{15}$
OUTER CODING	BCH
INNER CODING	LDPC
CODE RATE	QPSK : 1/4,1/3,2/5,1/2,3/5,2/3,3/4,4/5,5/6,8/9,9/10
	8PSK : 3/5,2/3,3/4,5/6,8/9,9/10
	16APSK : 2/3,3/4,4/5,5/6,8/9,9/10
	32APSK : 3/4,4/5,5/6,8/9,9/10
SYMBOL RATE	QPSK : 1Mbaud～45Mbaud
	8PSK : 1Mbaud～30Mbaud
	16APSK : 1Mbaud～20Mbaud
	32APSK : 1Mbaud～15Mbaud
USEFUL BIT RATES	QPSK(64,800bit,Pilot) 0.5Mb/s～78.6Mb/s
	QPSK(64,800bit,No Pilot) 0.5Mb/s～80.5Mb/s
	QPSK(16,200bit,Pilot) 0.4Mb/s～76.1Mb/s
	QPSK(16,200,No Pilot) 0.4Mb/s～77.8Mb/s
	8PSK(64,800bit,Pilot) 1.7Mb/s～78.6Mb/s
	8PSK(64,800bit No Pilot) 1.8Mb/s～80.4Mb/s
	8PSK(16,200bit,Pilot) 1.7Mb/s～75.8Mb/s
	8PSK(16,200bit,No Pilot) 1.7Mb/s～77.3Mb/s
	16APSK(64,800bit,Pilot) 2.6Mb/s～69.7Mb/s
	16APSK(64,800bit,No Pilot) 2.6Mb/s～71.3Mb/s
	16APSK(16,200bit,Pilot) 2.5Mb/s～67.2Mb/s
	16APSK(16,200bit,No Pilot) 2.5Mb/s～68.4Mb/s
	32APSK(64,800bit,Pilot) 3.6Mb/s～65.4Mb/s
	32APSK(64,800bit,No Pilot) 3.7Mb/s～66.8Mb/s
	32APSK(16,200bit,Pilot) 3.4Mb/s～62.4Mb/s
	32APSK(16,200bit,No Pilot) 3.5Mb/s～63.7Mb/s
FRAME SIZE	64,800bit(normal), 16,200bit(short)
ROLL OFF FACTOR	20%,25%,35%
MODULATION	QPSK,8PSK,16APSK,32APSK

Main Parameters of DVB-C

	DVB-C(Annex A)
COMPLIANT	EN300.429
MAX TS RATE(188Byte)	51.31Mbps
MAX TS RATE(204Byte)	55.68Mbps
RANDOMIZATION	$1+X^{14}+X^{15}$
OUTER CODING	RS(204,188,t=8)
INTERLEAVING	Convolutional interleaving depth I=12
ROLL OFF FACTOR	15%
CONSTELLATION	QPSK,16,32,64,128,256QAM
MODULATION	QAM

Main Parameters of DVB-S

	DVB-S
COMPLIANT	EN300.421
MAX TS RATE(188Byte)	72.573529Mbps
MAX TS RATE(204Byte)	78.75Mbps
RANDOMIZATION	$1+X^{14}+X^{15}$
OUTER CODING	RS(204,188,t=8)
INTERLEAVING	Convolutional interleaving depth I=12
CODE RATE	1/2,2/3,3/4,5/6,7/8
ROLL OFF FACTOR	35%
MODULATION	QPSK

Main Parameters of ATSC

	ATSC
COMPLIANT	ATSC DOC A53,A54
MAX TS RATE (188Byte)	19.392658Mbps
RANDOMIZATION	$1+X+X^{3}+X^{6}+X^{7}+X^{11}+X^{12}+X^{13}+X^{16}$
OUTER CODING	RS(207,187,t=10)
INTERLEAVING	Convolutional interleaving depth I=52
TRELLIS CODE	R=2/3
ROLL OFF FACTOR	11.52%
MODULATION	8VSB

Main Parameters of ITU-T J.83B

	ITU-T J.83B(Annex B)
COMPLIANT	ITU-T J.83B
MAX TS RATE(188Byte)	31.81064Mbps
MAX TS RATE(204Byte)	42.113736Mbps
RANDOMIZATION	$1+X^{7}+X^{3}$
OUTER CODING	RS(128,122,t=3)
INTERLEAVING	Convolutional interleaving level1、level2
ROLL OFF FACTOR	18%(64QAM),12%(256QAM)
CONSTELLATION	64QAM,256QAM
MODULATION	QAM

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