

Specifications

Vision modulator

Video input signal (standard level)	1 V pp into 75 Ω
Standards	B/G, D/K, I, K1, L/L', M, N
Video input	1 on front panel with loop-through filter (high-impedance), with internal or external 75 Ω termination 2 on rear panel (75 Ω)
Connectors	BNC
Selection of inputs	automatic or manual
Return loss (0 to 6 MHz)	>34 dB for all video inputs

IF output signals

Frequency drift (internal 10 MHz reference)	<2x10 ⁻⁶
Vision-carrier frequency with vestigial-sideband filter (SAW)	38.9 MHz for B/G, D/K, I 32.7 MHz for L/L', K1 (sound: mono) 38.9 MHz for L/L' (sound: mono/NICAM) 45.75 MHz for M, N

Vision-carrier frequency with double-sideband modulation	32 MHz to 46 MHz, selectable in 10 kHz steps over the full range
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IF output level	-3 dBm ± 0.5 dBm into 50 Ω
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IF output	1 internal (for RF upconverter) 1 external (for 50 Ω termination)
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Harmonics suppression

Harmonics	>40 dB
Nonharmonics	>60 dB

Modulation characteristics

Type of modulation	C3F (A5C), negative, for B/G, D/K, I, K1, M, N C3F (A5C), positive, for L/L'
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Group-delay precorrection

(max. 3 settings per multistandard plug-in)

standard B/G, ITU-R	
standard B/G, ITU-R 1/2	
standard B/G, Sweden (A)	
standard B/G, Australia	
standard D/K, ITU-R, Report 308	
standard D/K, OIRT, TK-III-830	
standard I, full precorrection, South Africa	
standard K1	
standard M/N, FCC	
full precorrection (flat)	

Operating mode

double-sideband modulation with or without group-delay precorrection for IF 32 MHz to 46 MHz
or
vestigial-sideband modulation (SAW filter) with or without group-delay precorrection for standards B/G, D/K, I, L/L', M, N, K1

Level control

Clamping	on (to back porch); hard or soft clamping selectable, off
Average value for standards with negative modulation (clamping off, AGC off)	±50% offset
Hum suppression in hard-clamped mode	≥57 dB (with 30% superimposed hum)

Amplitude-frequency response

Double-sideband modulation, precorrection off			
Vision carrier ±5 MHz	≤0.15 dB		
±8 MHz	≤0.3 dB		
Vestigial-sideband modulation			
B/G 38.9 MHz IF	with precorrection	≤0.5 dB	(-0.6 to +4.8 MHz)
D/K 38.9 MHz IF	with precorrection	≤0.5 dB	(-1 to +5.8 MHz)
I 38.9 MHz IF	w/o precorrection	≤0.5 dB	(-1 to +4.8 MHz)

L/L'	32.7 MHz IF	w/o precorrection	≤0.5 dB	(-1 to +5.8 MHz)
M	45.75 MHz IF	with precorrection	≤0.6 dB	(-0.6 to +4 MHz)

Group-delay response

Double-sideband modulation, precorrection off, vision carrier ±5 MHz	≤10 ns	
Group-delay precorrection		
0 to 4.43 MHz	≤10 ns	
4.43 MHz to 4.8 MHz	≤15 ns	
Vestigial-sideband modulation	additional ripple due to SAW filter	
B/G	≤20 ns	(-4.8 MHz to +0.5 MHz)
D/K	≤20 ns	(-5.5 MHz to +0.5 MHz)
I	≤30 ns	(-5.2 MHz to +1 MHz)
L/L'	≤20 ns	(-1.25 MHz to +6 MHz)
M, N	≤20 ns	(-4 MHz to +0.5 MHz)

Residual carrier

Setting range	0 to 30%
Resolution	0.1%
Error	<1.5%

Modulation nonlinearity

Modulation in range 8% to 100%	≤1.5% (for standards with negative modulation)
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Differential gain error

for colour subcarrier modulated in range 10% to 85%	≤1.5% (for standards with negative modulation)
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Differential phase error

for colour subcarrier modulated in range 10% to 85%	≤1° (for standards with negative modulation)
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Video signal-to-noise ratio

Double-sideband and vestigial-sideband modulation, measured to ITU-R Rec. 567	
rms, weighted, 0.2 MHz to 5 MHz	≥70 dB
hum, peak-to-peak, 0 to 1 kHz	≥60 dB

Intercarrier signal-to-noise ratio

FuBK test pattern	56 dB (30 kHz deviation)
All-black picture	58 dB (30 kHz deviation)

Intermodulation measurement (fixed programs)

(Level in dB)	Vision carrier	Sound carrier 1	Sound carrier 2*	Sideband
Intermodulation IM	0	-10	-20	off
	IM/K	-8	-10	-16.5
	IM/B	-5.5	-11.5	-12
Linearity LIN1	-2.5/-8	-10	-20	-32
	LIN2	-2.5/-20	-10	-32

*) In connection with NICAM Modulator SFM-B10 only.

(Linearity measurement with vision-carrier level switching every 2 s)

Sound 1 modulator, sound 2 modulator

AF signal input

B/G, D/K, I, M, N, K1	+6 dBm (1.546 V rms) for 0 to ±100 kHz deviation, floating, Z _{in} >5 kΩ, switchable internal/external
L/L'	+6 dBm (1.546 V rms) for m = 0 to 100%

Sound-carrier IF

Frequency	settable
Setting range	f _{vision carrier} - f _{sound} ≤ 7 MHz
Accuracy	<2 x 10 ⁻⁶
Level	settable
Accuracy at standard level	
Sound 1: -13 dB with B/G, D/K, I, M/N	≤±0.5 dB
-10 dB with K1	
Sound 2: -20 dB with B/G, D/K, L	≤±0.5 dB
Accuracy over setting range	
Sound 1 referred to -6 dB	
-6 dB to -16 dB	≤±0.3 dB
>-16 dB to -34 dB	≤±0.6 dB
Sound 2 referred to -12 dB	
-12 dB to -22 dB	≤±0.3 dB
>-22 dB to -38 dB	≤±0.6 dB

Modulation characteristics

B/G, D/K, I, M, N, K1	F3, with preemphasis 50 μ s or 75 μ s
Type of modulation	>70 dB (referred to 30 kHz deviation)
Signal-to-noise ratio	
L/L'	
Type of modulation	A3, without preemphasis
Signal-to-noise ratio	>70 dB, weighted and unweighted (ref. to 100% modulation)

AF generator (DSP)

	separately selectable for left and right channel or mono 1 and mono 2
Setting range	30 Hz to 15 kHz
Resolution	10 Hz
Frequency error	$\leq \pm 0.1\% \pm 3$ Hz
Distortion (measured via modulator/demodulator)	<0.3% (60 dB)%

TV stereo/dual-sound coder

AF input signals	L/R or AF1/AF2
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AF output signals (coded)

IRT coding	Sound channel 1	Sound channel 2
Mono	AF	–
Mono and pilot	AF	AF + pilot
Dual sound	AF1	AF2 + pilot
Stereo	m = 0.5x (L+R)	R + pilot
Korean coding	m = 0.5x (L+R)	0.5x (L–R) + pilot
Crosstalk		
Dual sound	>70 dB	
Stereo	>46 dB	
Pilot carrier	in sound channel 2	
Pilot deviation	1 kHz to 4 kHz	
Pilot frequency IRT	54.69 kHz = 3.5 f _H	
Korea	55.07 kHz	

NICAM generator

Operating modes

stereo
mono + data
dual sound
data

Audio frequencies

Setting	separately for left and right channel or mono 1 and mono 2
Setting range	0 to 15 kHz
Resolution	20 Hz
Frequency error	<1 Hz

Audio amplitude (headroom)

Setting	separately for left and right channel or mono 1 and mono 2
Preemphasis J17 on (ref. to 400 Hz)	
Setting range	16.5 dB to 60 dB
Resolution	0.1 dB
Error in range 16.5 dB to 30 dB	<0.3 dB
Preemphasis J17 off (ref. to 0 to 15 kHz)	
Setting range	0 to 60 dB
Resolution	0.1 dB
Error in range 16.5 dB to 30 dB	<0.3 dB
Overall setting error	<1 dB

Data sequence

11 bits, freely selectable, periodic repetition

Control bits

C3 and C4, freely selectable in all operating modes

Additional data

AD0 to AD10, freely selectable in all operating modes

Data output

Data rate	728 kbit/s
Output level	TTL into 75 Ω (AC-coupled)

Clock output

Clock frequency	728 kHz
Output level	TTL into 75 Ω (AC-coupled)

NICAM modulator

Operating modes

Internal	data stream from NICAM generator
External	external data stream (with or without clock)
PRBS	pseudo-random bit sequence
CW	continuous wave (unmodulated carrier)
TEST I/Q	3 fixed 11-bit sequences for direct I/Q modulation
Failure of external data	automatic switchover to internal PRBS

Bit error rate (BER)

BER internal (adjustable)	2×10^{-3} to 1.2×10^{-7} /off
external	bit errors added to external data signal

I/Q signals

interchange of I and Q paths possible

Type of modulation

differential QPSK

Data rate

728 kbit/s to NICAM specifications

Digital pulse filtering

Resolution	8 bit
Form factor	
B/G, L/L'	40% cosine roll-off
I	100% cosine roll-off

Spurious emissions

B/G, L/L' (>290 kHz)	<–40 dB
I (>390 kHz)	<–40 dB

Amplitude error (± 182 kHz)

<0.5 dB

Group delay

<50 ns

QPSK phase error

<0.15° (digital modulation)

Level error

from 0 to 15 dB	<0.5 dB
in the whole range	<1 dB

Spurious

<–57 dB

Carrier frequencies (adjustable)

B/G	33.05 MHz
I	32.348 MHz
L/L'	33.05 MHz
Tuning range	± 200 kHz
Resolution	1 Hz

Inputs

Data input	
Data rate	728 kbit/s to NICAM specifications
Capture range of PLL	≤ 10 bit/s
Input impedance	75 Ω
Input level	TTL, into 75 Ω (DC-coupled)
Clock input	
Clock frequency	728 kHz
Capture range of PLL	≤ 40 Hz
Input level	TTL, into 75 Ω (AC-coupled)

Outputs

Intercarrier output	
Output impedance	50 Ω
Output level	–3 dBm to –25 dBm (manually adjustable)
Intercarrier frequencies (adjustable)	
B/G	5.85 MHz (5 MHz to 9 MHz)
I	6.552 MHz (5 MHz to 9 MHz)
L/L'	5.85 MHz (± 200 kHz)
Resolution	1 Hz
Spurious with CW (0 to 20 MHz), 0 dBm output level	
Harmonics	<–40 dB
Nonharmonics	<–50 dB

Upconverter

Frequency

IF input 1	for internal modulator
IF input 2	for external modulator
Input frequency range	32 MHz to 46 MHz ± 8 MHz for double-sideband modulation
Output frequency range	5 MHz to 1000 MHz, 1 Hz steps
RF tuning	entry of frequencies via numeric keypad in MHz or entry of TV channels (country-specific)

RF sideband (selectable)	upper (standard) or lower sideband
Frequency deviation (with internal 10 MHz reference frequency)	$<2 \times 10^{-6}$
Reference frequency	
Input/output frequency	10 MHz
Input level (10 MHz, external)	0.1 to 1 V _{rms}
Output level (rms)	5 dBm \pm 1 dB (corr. to 395 mV/50 Ω)

Level	
IF input level range	0 to -7 dBm into 50 Ω
RF output level (max. level)	
Low noise	+10 dBm to -99 dBm
Normal	+6 dBm to -99 dBm
Low distortion	0 to -99 dBm
Resolution	0.1 dB
Total error	$<\pm 1.5$ dB
Return loss (level mode: normal, 0 dBm RF output level)	
50 Ω output	>18 dB
75 Ω output	>15 dB
RF frequency response in TV channel	≤ 0.5 dB (5 MHz to 950 MHz)

Overall transmission characteristics

(spurious signals with vision/sound ratio of 10:1, * = low-distortion mode)

Nonharmonics*	≥ 66 dB
Intermodulation	
Vision (0 dB)/sound 1 (-10 dB)	>56 dB
Vision (-8 dB)/sound 1 (-10 dB)/ Sound 2 (-16 dB)	>76 dB
Harmonics	
LOW DIST.	≥ 45 dB
NORMAL	≥ 40 dB
Differential gain error*	$\geq 2.5\%$
Differential phase error*	$\geq 2^\circ$
Video S/N ratio, (low-noise mode, referred to black-to-white transition)	
0.2 MHz to 5 MHz (noise)	≥ 66 dB rms, weighted
10 Hz to 1 kHz (hum)	≥ 60 dB pp, unweighted
Audio S/N ratio up to 15 kHz (with pre- and deemphasis)*	≥ 66 dB (30 kHz deviation)

General data

Rated temperature range	+5 °C to +45 °C
Operating temperature range	0 to +50 °C
Storage temperature range	-40 °C to +70 °C
Power supply	100 V to 120 V/200 V to 240 V +10/-15%, 47 Hz to 63 Hz (160 VA)
Dimensions (W x H x D)	435 mm x 192 mm x 460 mm
Weight	20 kg

Ordering information

Basic units

TV Test Transmitter	SFM	2007.9106.10
Modulator unit with vision modulator, FM sound modulator with AF generator and multistandard plug-in (3 TV standards) (without RF upconverter)		
TV Test Transmitter	SFM	2007.9106.50
Modulator unit with vision modulator, FM sound modulator with AF generator and multistandard plug-in (3 TV standards) and RF upconverter, 5 MHz to 1000 MHz, 50 Ω		
TV Test Transmitter	SFM	2007.9106.90
RF upconverter, 5 MHz to 1000 MHz, 50 Ω (without modulator unit)		

Accessories supplied

Audio cable, power cable, spare fuses, operating manual

Options

Multistandard Plug-in	SFM-B7	2008.0248.02
2 VSB SAW filters, 3 group-delay precorrections for further TV standards		
Sound 2 Modulator	SFM-B9	2008.0183.02
Switchable FM/AM, dual-sound coder (without AF generator)		
QPSK Sound Modulator for NICAM 728 with NICAM generator, I/Q test signal, BER and PRBS	SFM-B10	2008.0302.02
RF Output, 75 Ω (selectable)	SFM-B16	2007.9212.02

Recommended extras

Memory Card, 4 Mbyte (flash)	0008.5499.00
Cable connector, Lemo Triax	0231.9182.00
Audio cable (2 x Lemo Triax/ 1 x 5-way to DIN 41524)	2020.6636.00
19" Adapter (4 height units) for rackmounting	ZZA-941 0396.9471.00