Epsillon
The World of Electronics

DV601/656
Analog

TRF-950

Multistandard Test Pattern Generator

Datasheet

PAL, NTSC, SECAM and all substandards
Teletext, Closed captions, VPS
All Analog Video Outputs, Audio Interface
User Patterns And Test Signals, Motion Simulator
Digital Video Generator (ITU-BT.601/656)

USB 2.0 Interface, RS-232 Port + User I/O Pins

Optional:
TV RF Modulator NICAM (Stereo + AM/FM Mono)
TV RF Modulator DTI (Dual-Tone ID, Stereo)
SAT RF Modulator with PLL (Stereo)

1 Technical specification

Display	LCD 2x24 Characters, LED Backlight
Control	Buttons on front panel IR Remote Control USB Interface, RS-232 Interface, User input and output pin
Setup	Menu, 40 presets, Automatic mode (periodical switching of enabled presets)
TV standards	PAL, NTSC, SECAM and all substandards
Picture format	4/3, 14/9, 16/9
TV lines count	625/ 50 Hz, 525/ 60 Hz
Scanning	Interlaced, non-interlaced
Colour subcarrier	According to PAL, SECAM or NTSC standard Non-standard frequency support (defined by user, 8 types)
Teletext	Enhanced teletext (ETS300706, 6.9375 Mb/s), Tool for teletext design World Standard Teletext (WST, 5.7272 Mb/s) North-American BroadcastText System (NABTS, 5.7272 Mb/s)
Closed caption	Line 21, EIA-608, 2 bytes per field, both 50/60 Hz systems, programmable
Wide screen siganalling	Line 23, EN-300294
VPS	Line 16, ETS-300231, 40 bits programmable
Test patterns	Primary patterns (suitable for all TV systems) & Extended patterns (specific) 128 or more default test patterns (limited by installed memory only) All patterns can be modified by user, Tool for pattern design
Motion patterns	Motion simulation (horizontal pattern moving, speed from slow to fast)
Generation method	TRUE PICTURE technology (max.TV system resolution)
Inputs & Outputs	
CVBS (Video)	75 ohm, level 1,2 Vpp (colour bars 100/0/100/0), level 1 Vpp (colour bars 75/0/75/0)
S-Video	
Y (luminance)	75 ohm, level 1 Vpp (colour bars 100/0/100/0)
CHROMA (chrominance)	75 ohm, level 0,6 Vpp (colour bars 100/0/100/0)
R (red)	75 ohm, level 0,7 Vpp (colour bars 100/0/100/0)
G (green)	75 ohm, level 0,7 Vpp (colour bars 100/0/100/0)
B (blue)	75 ohm, level 0,7 Vpp (colour bars 100/0/100/0)
C_R, Y, C_B	RGB outputs can be switched to color difference mode, levels are adjustable
Sync	Composite sync (typ. 1Vpp on CVBS output), H and V pulses (LVTTL 3.3V)
Audio	2 audio outputs (typ. 1.1Vrms/10k, level, frequency and shape is adjustable) 2 channel audio input, typ. level: 1.55 Vrms/ 1 kOhm
Digital Video Output	8 bit data stream output, 4:2:2 format, parallel according to ITU-BT.656/601 Additional signals (H and V sync, data clock), LVTTL 3.3V
PC Interface	USB 2.0, Drivers for W98 & Windows XP, SDK on request for devolepers
Control port	RS-232 duplex channel for instrument control from user application Optically insulated input pin and output pin (1+1), custom function 5V/50mA & 3V/ 30mA Power source for external application
Power supply	
DC version, 6V	6.5 - 9V/ max. 2.1 A (dependent on configuration), DC power plug 2.1 mm
DC version, 12V	12.5 - 16V/ max. 2.1 A (dependent on configuration), DC power plug 2.1 mm *(Certified AC/ DC stabilized power adapter as default accessories)*
AC version	220-240 V/ 50-60 Hz, typ. 18 W (operation), typ. <1 W (standby) (Version for 110-120 V/ 50-60 Hz available on special request) Connector type: IEC-320 (PC type power inlet)
Dimensions (WxHxD)	432 x 43 x 203 [mm], 17 x 1.7 x 8 [inch], fixing parts for 19" rack system
Weight	Typ. 2.0 kg (dependent on configuration)

1.1 TV RF Modulator NICAM (optional)

TV output	
Standards	B/G, I, D/K, H, L, M/N
Output level	>110 dBuV
Attenuator	0..-31 dB, step 1 dB
Spurious signals suppression	>60 dB
Picture carrier frequency	47 ..860 MHz
Video modulation	VSB AM, Negative or Positive
Stereo sound NICAM	
NICAM carrier	5.850 MHz, 6.552 MHz
Mono sound	
Subcarrier frequency	4,500 MHz, 5,500 MHz, 6,000 MHz and 6,500 MHz
Modulation type	FM or AM
Modulation signal	Frequency, level and shape adjustable

1.2 TV RF Modulator DTI (Dual-Tone ID, optional)

TV output	
Output level	30 ..80 dBuV (adjustable via digital attenuator), ripple -4 dB/ +1 dB
Picture carrier frequency	38 ..855,25 MHz, tuning step 62.5/ 125/ 250/ 500/ 1000 kHz (or TV channel)
Video modulation	Negative AM DSB, adjustable modulation depth 72,5% to 90%
I. sound subcarrier frequency	4,500 MHz, 5,500 MHz, 6,000 MHz and 6,500 MHz
Picture to sound ratio	-11 ..-18 dB (adjustable)
Modulation type	FM, adjustable frequency deviation
Modulation signal	Frequency, level and shape adjustable
II. sound subcarrier frequency	5,000 ..7,000 MHz, tuning step 1 kHz
Picture to sound ratio	-13 ..-20 dB (adjustable)
Modulation type	FM, adjustable frequency deviation
Modulation signal	Frequency, level and shape adjustable
Pilot signal	54,6875 kHz, +/-1Hz
Frequency shift	2,5 kHz (II. sound subcarrier frequency deviation is 30 kHz, or else relative)
ID signal	AM (m=0,5), 0 Hz (mono), 117,5 Hz (stereo), 274,1 Hz (duo)
Validity	Interlaced mode and vertical frequency 50 Hz

1.3 SAT RF modulator (optional)

SAT output	
Output level	60 ..85 dBuV (adjustable via digital attenuator), ripple +/-5 dB
Picture carrier frequency	860 ..1900 MHz, tuning step 125 kHz
Video modulation	FM, CCIR405-I preemphasis
I. sound subcarrier frequency	5,000 ..8,500 MHz, tuning step 1 kHz
Modulation type	FM, frequency deviation 30 kHz
Modulation signal	Frequency, level and shape adjustable
II. sound subcarrier frequency	5,000 ..8,500 MHz, tuning step 1 kHz
Modulation type	FM, frequency deviation 30 kHz
Modulation signal	Frequency, level and shape adjustable

See „Owner's Manual” for detail instructions, please.

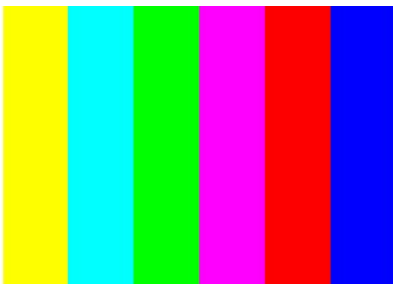
2. Test Patterns

The generator is provided with set of primary patterns and extended patterns. Primary patterns are not system dependent, thus it can be displayed in TV systems with vertical frequency 50 Hz (625 lines) and also with vertical frequency 60 Hz (525 lines). Extended patterns are system specific and can be displayed only in TV system that was selected during pattern design (either 50 Hz/ 625 lines or 60 Hz/ 525 lines).

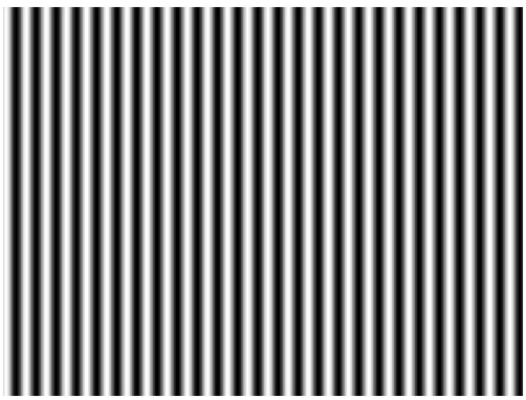
All patterns can be modified or designed by user. *Note: Your distributor can mark some patterns as fixed. This patterns cannot be modifed until the mark is removed.*

Use TRF Manager software for pattern design (or modification) and for transfer to the generator. Integrated pattern designer allows you to design your own patterns in a few minutes. The CD also contain a lot of patterns ready for use, including specialized patterns for PAL and NTSC.

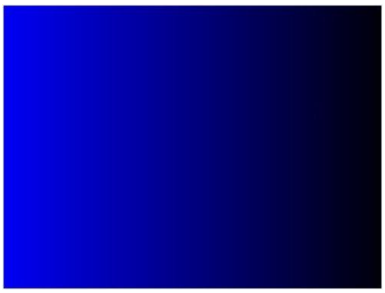
For detail information concerning the current set of patterns see the „Owner's Manual", please. The images below show some examples of Primary patterns and on the next page are some examples of Extended patterns.



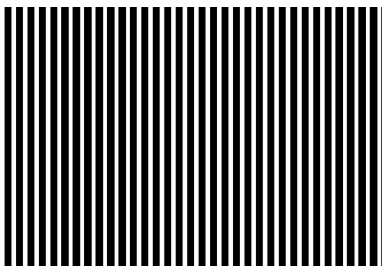
Color bars



Frequency (sin wave)

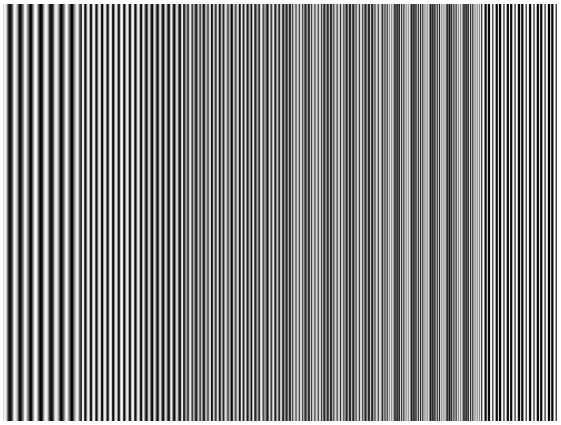


Gradient (Blue 100%-0%)

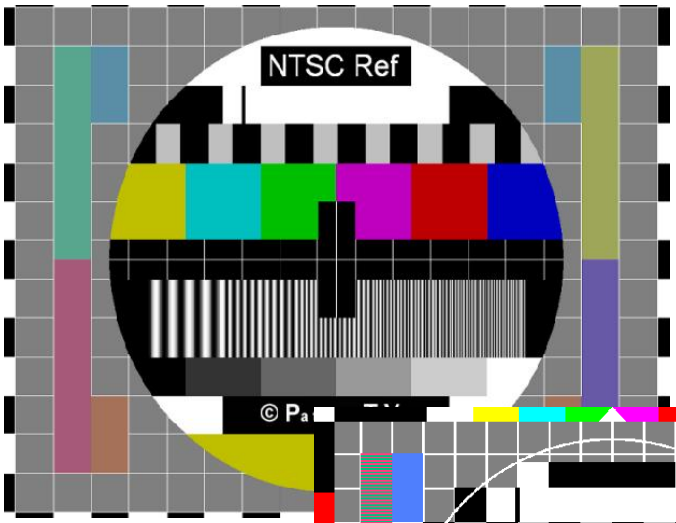


Rectangular pulses

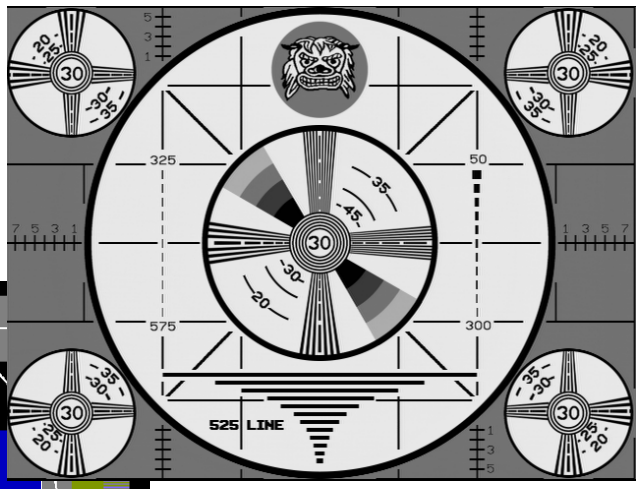
Gradient (Grey 0%-100%)



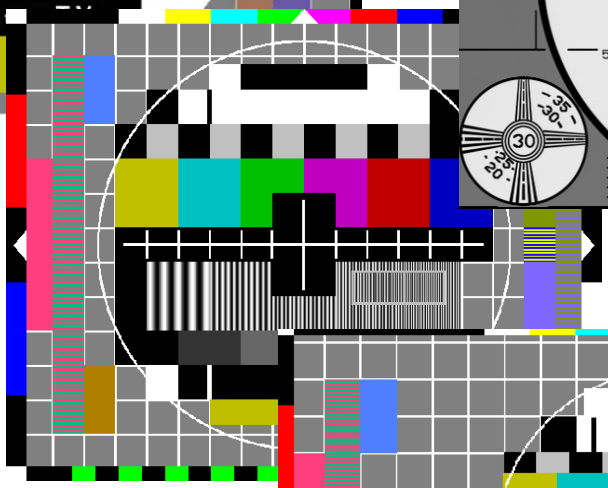
Multiburst 1.0/1.9/2.7/3.4/4.5/6.8 [MHz]



NTSC, SECAM

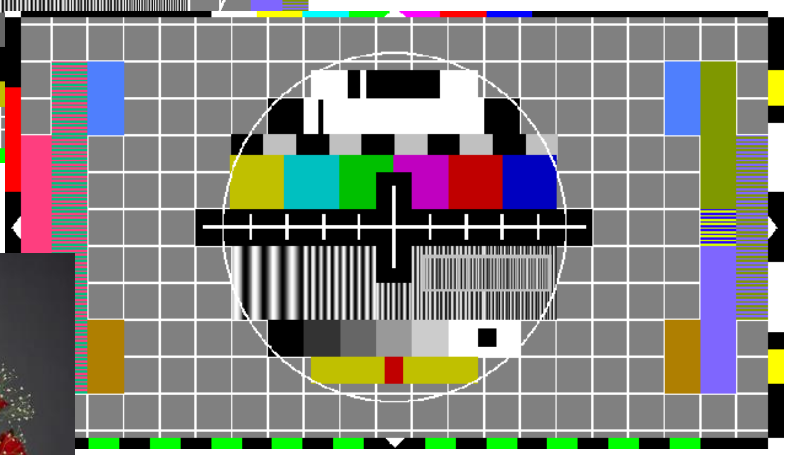


User



PAL

User



PAL 16:9

Important note

Default (factory) set of patterns is free for use in all countries. Be aware that some test patterns (available from third parties for example) may be copyrighted in some countries. The generator manufacturer carry no responsibility for the patterns provided or used by the customer.

2.1 Motion simulation

The generator provide high quality static test patterns by default. To meet a requirements of some applications for dynamic patterns, the generator has function that simulate motion. If the function is enabled, the static pattern start to move horizontally from left to right and vice versa. The motion speed can be set to Slow, Medium or Fast.

3. Other features

This instrument has a lot of features, that should meet the most of application's requirements and should simplify the operations. This cover functions like Line Gate, that provide sync. signal at selected line (selected line is also highlighted on pattern!) and other. For detail information see the Owner's manual, please.

The sections below describes data transmission inside VBI (Wide Screen Signalling, Teletext, Closed Captions and VPS). All the functions can be enabled or disabled separately.

3.1 Wide screen signalling

This function use first half of line 23 for information about pattern format. There is about 8 different settings (the default data can be modified by TRF Manager, including mode, etc.).

3.2 Teletext

The generator provides enhanced teletext signal according to the ETS300706 standard. The bitrate is 6.9375 Mbps. Teletext data are transmitted inside selected lines during vertical blanking interval. The user can specify what lines (and what fields) can cary the telext data.

The instrument contain set of the most popular teletext pages. If you need to create your own teletext pages, use „TRF Manager” software.

This tool enebles you to edit teletext pages at different levels: from single byte editing up to visual design. Visual mode is the simplest way how to create new teletext pages in a few minutes. Advanced designers can use also packet editors. The page can contain all items and objects introduced by the ETS 300-706 teletext specification.

Number of teletext pages is limited only by available memory. There is a lot of space for more than hundred standard teletext pages. In any case the TRF Manager inform you what amount of memory is free.

Note: The teletext can also carry PDC (Program Delivery Control) data according to the ETS300-231 standard.

3.3 Closed captions

This feature allows transmission of closed captions or extended data inside line 21. This is primarily intended for NTSC-M TV system, but can be also used in systems with vertical frequency 50 Hz. The bitrate is 0.504 Mbps for NTSC-M and other strandards with vertical frequency 60 Hz, or 0.5 Mbps for standards with vertical frequncy 50 Hz.

Data are transmitted by two bytes per field, each preceded by run-in clocks and framing code. User can select filed (odd, even or both) for data transmission.

From the factory the generator contain basic closed caption test strings. By using the TRF Manager software, the user can design his own closed captions and edit the data at byte (character) level.

3.4 VPS

The VPS system is used by European and other countries to control VCRs. Data format is the same as in case of PDC. The bytes 5, 11, 12, 13 and 14 can be modified by user. Data are transmitted in line 16.

4. Conditions and safety

The generator is designed for desktop use or for use inside 19" Rack systems. The instrument is calibrated at temperature of 25 degrees Celsius (opertating temperature range is 15..35 degree Celsius) and can be used up to 80% humidity. Do not splash it or clean with water, solvents etc. Use only dry antistatic duster for cleaning. Don't touch connectors pins.

This instrument is powered by certified safety transformer. The transformer is either built in (AC version) or external (DC versions). When connected to mains, the generator enter standby mode (power indicator lit). If the generator is not used for longer time, disconnect it from mains.

Important note: Metallic parts (panels) are not connected to PE pin.

4.1 Connection and safe operation

All output and input connectors have common ground -the connectors are thus interconnected (i.e. ground and shielding of each connector is connected to all other connectors). Be very careful when connecting to this instrument more devices. Never connect devices with different ground potential, with different voltage between shieldings or with potential between ground and shielding.

Do not connect the generator to unsafety devices (galvanicly connected to mains, etc.)!

This is also important when connecting the generator to PC. Keep in mind that the generator connected to PC is also connected to it's ground.

Always think of your safety to avoid some accident or damage caused by improper connection. Keep also all known rules for safe work with electric instrument.

4.2 Legal notice

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All specifications are subject to change without notice.

Annex A Input & Output Connectors And Typical Signals

• Analog Red, Green, Blue

Connector type:	BNC female
Impedance:	75 Ohm
Voltage:	0.7Vpp (at 75 Ohm resistive load)
Inequality of output signal voltages:	2%
Polarity:	Positive
Coupling:	DC
Blanking level:	0 V
Offset:	100 mV
Gain (Y,C):	Programmable

• Analog C_R, Y, C_B

Connector type:	BNC female (alternative function of Red, Green and Blue output)
Impedance:	75 Ohm
Voltage Y:	1 Vpp (at 75 Ohm resistive load)
Voltage C_R, C_B:	0.7 Vpp (at 75 Ohm resistive load)
Inequality of output signal voltages:	2%
Coupling:	DC
Blanking level:	0 V
Offset:	100 mV
Gain (Y,C):	Programmable

• Analog Y, C

Connector type:	BNC female
Impedance:	75 Ohm
Voltage Y:	1 Vpp (at 75 Ohm resistive load)
Voltage C:	0.85 Vpp (at 75 Ohm resistive load)
Inequality of output signal voltages:	2%
Coupling:	DC
Blanking level:	0 V
Offset:	100 mV
Note:	Level is programmable together (see CVBS)

• Analog CVBS

Connector type:	BNC female
Impedance:	75 Ohm
Voltage:	1 Vpp (at 75 Ohm resistive load)
Range:	0 - 1.2 V
Resolution:	<10 mV
Polarity:	Positive
Coupling:	DC
Offset:	100 mV
Y/C delay:	<40 ns (programmable)
Black,blanking and burst level:	Programmable
Burst position:	Programmable
Chroma subcarrier:	3..5 MHz, programmable
White-to-black:	92.5 or 100 IRE

• DV 601/656 Port

Connector type:	D-Sub 15 pin (female)
Level:	LVTTL (3.3V)
Data format:	8 bit parallel, 4:2:2, ITU-BT.656/601
Pin 1:	Data Clock
Pin 9:	GND
Pin 2:	Line Gate (programmable)
Pin 10:	Field (0..first, 1..second)
Pin 3:	V-Sync (position programmable)
Pin 11:	H-Sync (position programmable)
Pin 4:	GND
Pin 12:	D7
Pin 5:	D6
Pin 13:	D5
Pin 6:	D4
Pin 14:	D3
Pin 7:	D2
Pin 15:	D1
Pin 8:	D0

• Audio In, Out

Connector type:	Jack 3.5mm stereo (female)
Level:	see Technical specification
Output Signal:	min. 300 Hz - 5 kHz, programmable shape and level

• USB

Connector type:	USB type B
Version and driver:	see Technical specification

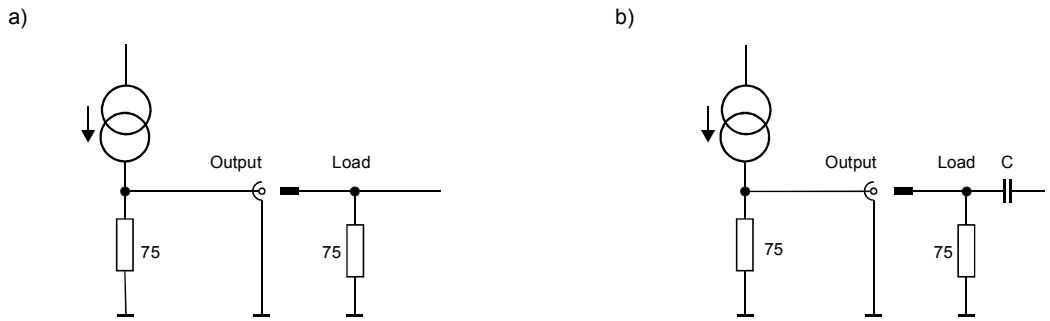
• Control Port

Connector type:	D-Sub 15 pin (female)
Pin 1:	Main +5V/50 mA (available also when power is off)
Pin 9:	RS-232 Enable (0 or NC..disabled, 1..Enabled)
Pin 2:	Connected to pin 1
Pin 10:	GND
Pin 3:	Generator TX (connect to RS-232 RX input)
Pin 11:	GND
Pin 4:	Generator RX (connect to RS-232 TX output)
Pin 12:	GND
Pin 5:	+5V/50 mA (when power is on)
Pin 13:	GND
Pin 6:	+3V/30mA (when power is on)
Pin 14:	Control output (Optocoupler, Emitter, V_{CE}<20V)
Pin 7:	Control output (Optocoupler, Collector, Imax=20mA)
Pin 15:	Control input (Optocoupler, Cathode, Uctrl 0V/3..9V))
Pin 8:	Control input (Optocoupler, Anode, Ifw limited)
RS-232 Interface:	Baud rate 9600 bps (programmable) 8 data bits, 1 start bit, 1 stop bit, odd parity

Annex B Analog CVBS, S-Video and RGB outputs

The pattern generator provide signals with direct-current component at analog outputs. Typical offset is about 100 mV, amplitude swing is dependent on current generator setup. Load impedance is 75 Ohm and have to be realized in form of resistive load by convention.

Figure (a) below show recommended load connection for applications, where direct-current component is required. Figure (b) show recommended load connection for applications, that don't need direct-current component (it is separated by capacitor „C").



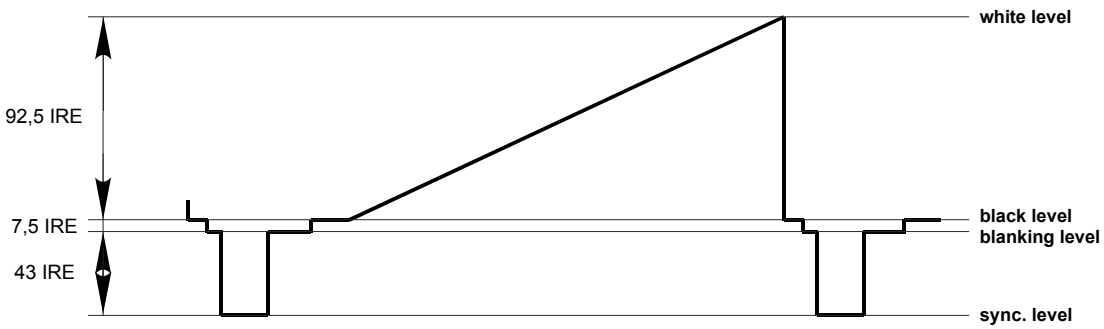
Load connection to analog output: DC component preserved (a), DC component separated (b)

Signal levels

Levels of analog TV baseband signal can be given either in absolute units (for example in Volts) or in relative units. Television technology often use well known relative unit IRE, established by Institute of Radio Engineers (IEEE ancestor).

The figure below show simple composite video baseband signal with total swing 143 IRE and 7,5 IRE black setup (no chrominance signal is visible). White is always defined to be 100 IRE above the blanking level (blanking level is defined to be 0 IRE).

Note: There are many television standards and substandards that don't use the 7,5 IRE setup and put the black level at blanking level.



Main levels of analog composite video baseband signal
(without chrominance, total swing 143 IRE, black setup 7.5 IRE above blanking level)

Annex C TRF-950, Ordering information

TRF-950

- All Analog Video Outputs
- Digital Video Output (DV 601/656)
- USB, Control Port, Audio
- One Flash disk for patterns and data
- DC version 6.5-9V incl. external AC/DC adapter (switching type, input: 100-240V)

Applicable options

FD2 (FD3, FD4) ...2, 3 or 4 Flash disks

DC12V ...DC version 12.5-16V incl. external power adapter (switching type, input: 100-240V)

AC240 ...AC version 220-240V/ 50..60Hz (built in transformer)
(AC version 110-120 V/ 50-60 Hz available on special request)

TRF-950 NICAM

- TV RF Modulator NICAM stereo, AM/FM mono (4.5/5.5/6.0/6.5 MHz)
- All Analog Video Outputs
- Digital Video Output (DV 601/656)
- USB, Control Port, Audio
- One Flash disk for patterns and data
- DC version 6.5-9V incl. external AC/DC adapter (switching type, input: 100-240V)

Applicable options

FD2 (FD3, FD4) ...2, 3 or 4 Flash disks

AC240 ...AC version 220-240V/ 50..60Hz (built in transformer)
(AC version 110-120 V/ 50-60 Hz available on special request)

TRF-950 TV

- TV RF Modulator DTI (Dual-Tone ID)
- All Analog Video Outputs
- Digital Video Output (DV 601/656)
- USB, Control Port, Audio
- One Flash disk for patterns and data
- DC version 12.5-16V incl. external power adapter (switching type, input: 100-240V)
  (AC version 110-120 V/ 50-60 Hz or 220-240 V/ 50-60 Hz available only on special request)

Applicable options

FD2 (FD3, FD4) ...2, 3 or 4 Flash disks

TRF-950 TV&SAT

- TV RF Modulator DTI (Dual-Tone ID)
- SAT RF Modulator
- All Analog Video Outputs
- Digital Video Output (DV 601/656)
- USB, Control Port, Audio
- One Flash disk for patterns and data
- DC version 12.5-16V incl. external power adapter (switching type, input: 100-240V)
  (AC version 110-120 V/ 50-60 Hz or 220-240 V/ 50-60 Hz available only on special request)

Applicable options

FD2 (FD3, FD4) ...2, 3 or 4 Flash disks

Notes

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