

PAL Video Measurement Set

VM700T Option 11 Data Sheet



VM700T Opt. 11.

Features & Benefits

- Many Capabilities in One Instrument
 - Digitizing Waveform Monitor
 - Digitizing Vectorscope
 - Picture Display
 - Group Delay and Frequency Response
 - Noise Measurement Set
 - Automatic Measurement Set
 - PAL and NTSC Standards
 - Unattended Monitoring of PAL Video Signals from Studios, STLs, Earth Stations, and Transmitters
- Measure Mode Provides Graphic Display of Measurements
 - ICPM
 - K-Factor
 - Differential Gain and Phase
 - Chrominance-to-Luminance Delay
 - Noise Spectrum
 - Group Delay with Sin x/x
 - Color Bars
 - Relative to Reference on Most Measurements

- Award-winning User Interface
- State-of-the-art Architecture
- Fast Update Rate
- Parallel and Serial Printer Ports
- Three Input Channels
- Channel Difference Modes
- External VGA Display Port
- Fully Documented Remote Control Operation Including GPIB
- Hardcopy for Analysis and Documentation

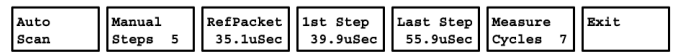
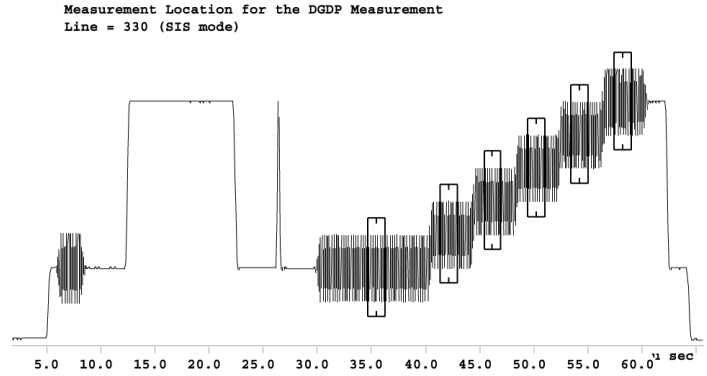
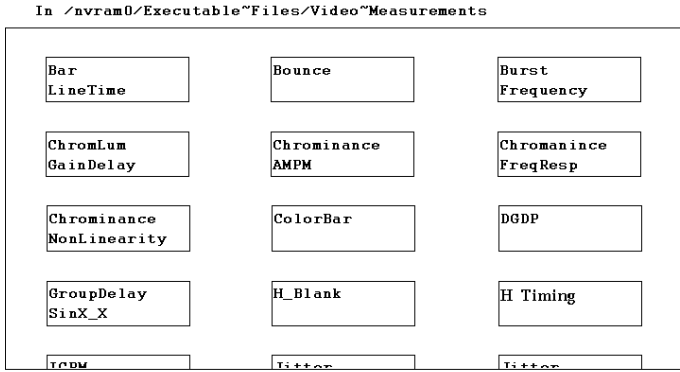
Applications

- Automated Manufacturing Test
 - Set-top-box Testing
 - DVD Testing
- Unattended Monitoring of PAL Video Signals from Studios, STLs, Earth Stations, and Transmitters
- Research and Development

PAL Video Measurement Set

Recognized with a technical Emmy award, Tektronix' world-class core competencies have enabled it to design and deliver the most comprehensive video measurement solutions in the industry.

Recognized as the de facto industry standard that keeps pace with evolving customer needs, the VM700T is a total solution for your baseband video and audio monitoring and measurement needs. Features such as an extremely fast and fully automatic measurement mode as well as full manual operation provide the first-time user as well as the seasoned professional an unequalled value for their test and measurement investment.



Main measure mode display of available measurements.

Measure mode DGDP special position acquisition feature.

Automatic Video Measurement Set

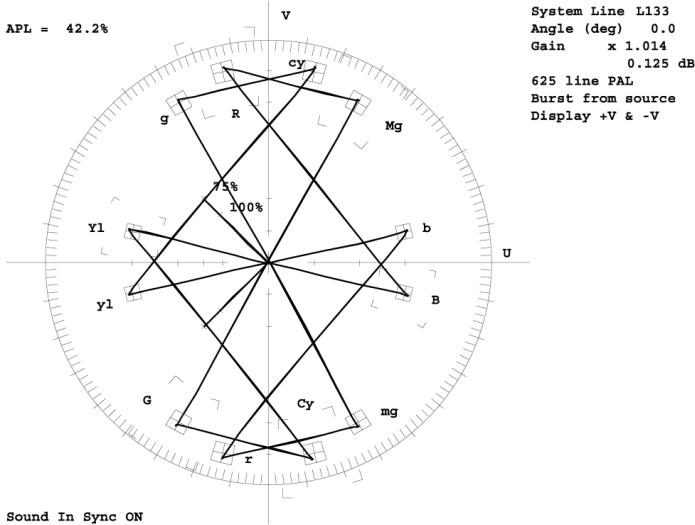
The VM700T Auto mode makes standard video transmitter measurements quickly and automatically, including those specified in CCIR Rep. 624-1, Rec. 567, and Rec. 569. Both vertical interval and full field measurements can be made and compared with user-defined limits. A dual limit verification system is employed to generate a caution or alarm message when either limit is violated. Reports can be generated and printed automatically at operator-scheduled times or triggered from a conditional event.

Graphic Displays of Measurements

Measure mode provides virtual real-time graphic displays of measurement results automatically. Vertical interval or full field measurements including noise spectrum, group delay, K-Factor, differential gain, and differential phase are presented as clever, easy-to-understand interactive digital displays. Such displays are indispensable when extremely fast

measurement update rates (up to 30 times a second) are required to provide instant feedback of critical adjustments and analysis of signal variations. User-definable limits are visually integrated into each graphic display and can be used to trigger a measurement report or a user-definable macro function. Such a function can, for example, dial out through a modem to report measurement results or control a signal router. A relative to reference mode allows normalizing to a signal source or eliminate signal path errors from the desired measurement. Up to 2 video references can be stored in NVRAM. Additionally, after downloading to a PC through the VM700T FTP driver, the video reference can be uploaded to another VM700T for reuse. A running averaging mode can be used to reduce the effect of noise. When additional measurement data is required, a user can custom configure measurement parameters and report format.

A powerful Test Signal search capability quickly and automatically locates and identifies valid test signals required for a selected measurement, eliminating the annoying and time-consuming task of manually locating test signals.

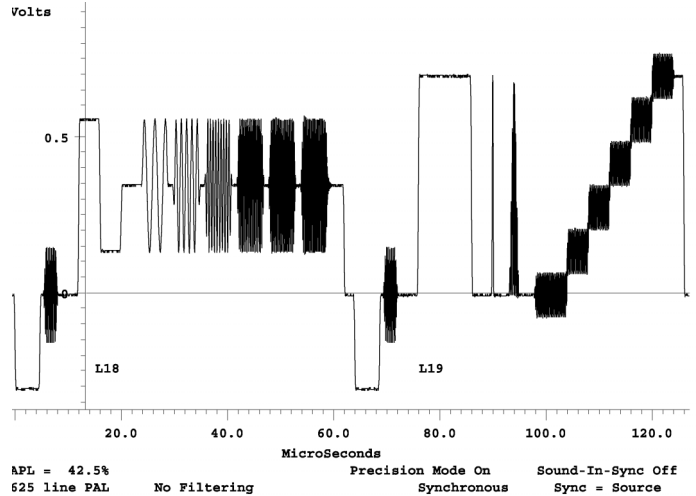


In Vector mode, the VM700T becomes a digital vectorscope with an electronic graticule. The "Color Bar Search" feature makes it easy to quickly display a line containing a color bar test signal.

Digital Waveform Monitor/Vectorscope

The VM700T Waveform mode application provides real-time graphics displays of the video signal allowing many additional measurements to be made manually. Easy-to-use measurement cursors are available to measure time, frequency, and amplitude parameters of a video signal. These cursors allow a very quick and precise location of the 10%, 50%, and 90% points on any transition. Cursor mode also employs an automatic calculation in the wave shape in the center of the display. The parameters calculated are sine peak-to-peak amplitude, frequency, and offset from blanking level. This is very useful for frequency response measurements with the Multiburst signal.

The waveform display can be expanded around any point both vertically and horizontally. Since the data is digitized, the display remains bright and easy to read at all expansion factors. The scales automatically expand with the



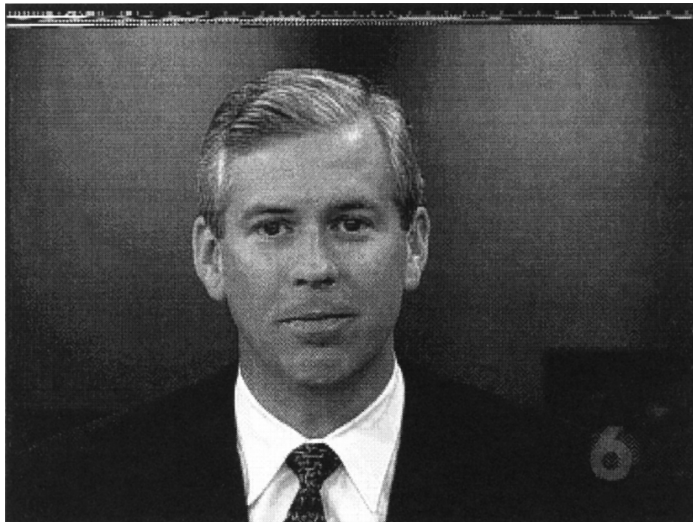
Vertical interval test signals can be seen very clearly for additional analysis of the signal. These can be printed as support documentation for automatic measurement results.

waveform, so all units are correct as displayed. A channel difference mode (A-B, A-C, B-A, B-C, C-A, and C-B) is also provided. A screen memory selection enables Envelope mode, which is useful for looking at teletext, Jitter, or other changes over time.

Vector mode provides the normal vectorscope display. The vectors may be rotated or expanded, with the rotation angle and gain values displayed numerically on the screen.

A unique "Find Color Bars" feature searches all video for Color Bars and displays the vectors if found. The vectors can be referenced to either the selected channel's burst or the burst of one of the other two channels or continuous subcarrier. The phase difference between the selected channel and the reference is always displayed.

Select Line in both Waveform and Vector modes can be used to quickly specify any line for display or automatic measurement if it is the proper signal.



Picture mode display. (video courtesy of KOIN-TV, Portland, Oregon)

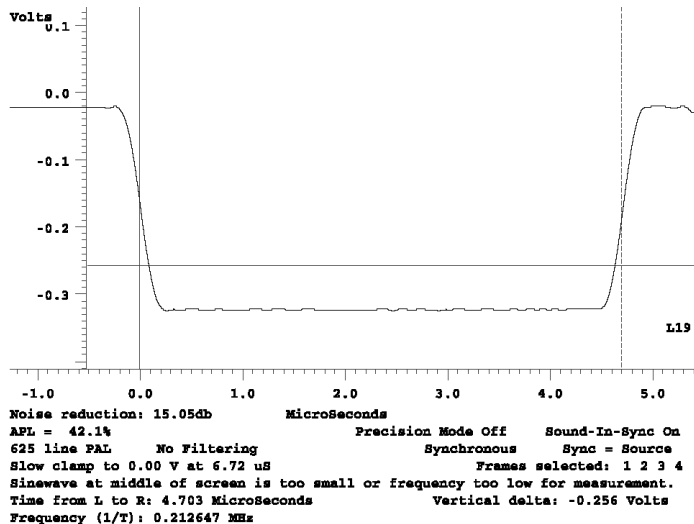
Picture Mode

The signal source can be quickly verified using the picture display. Additionally, a "bright-up" line select mode allows a user to select any video line for use in Measure mode or for viewing in Waveform or Vector mode.

User-programmable Functions

Function mode is an extremely powerful feature that allows a user to store a sequence of user operations as a macro function for later "playback."

For example, a set of measurements (complete with hardcopy commands) to be made on a transmitter demodulator video output, could be stored as a function labeled "DEMODO." The function "playback" could then be initiated manually, remotely, or completely automatically as a user-specified timed event. Function files can be stored as a text file on a PC for editing, copying, or uploading to another VM700T. Other function capabilities include controlling of external serial devices such as video/audio routers, switchers, signal generators, telephone modems, and many other devices which support RS-232 communications.



Even a single horizontal synchronization pulse can be displayed at a high intensity.

Hardcopy

All information on the screen may be printed in high-resolution graphics on printers supporting PostScript, Hewlett-Packard LaserJet, DeskJet and ThinkJet, or 24-Pin Epson graphics through the Centronics-compatible parallel port or standard RS-232C interface.

Automatic measurement results in text format can be printed on most ASCII printers using the parallel or serial ports.

Remote Operation

The VM700T has a powerful and fully documented remote control language. The VM700T can thus be operated from a remote terminal using RS-232C to monitor unattended transmission systems. In addition, all files can be uploaded to a main computer and downloaded to other VM700Ts. Two different protocols are supported: FTP (File Transfer Protocol) and TELNET. The user can also select a "no protocol" mode of the RS-232C interface when dealing with low baud rates. File transfers, however, can only take place with FTP.

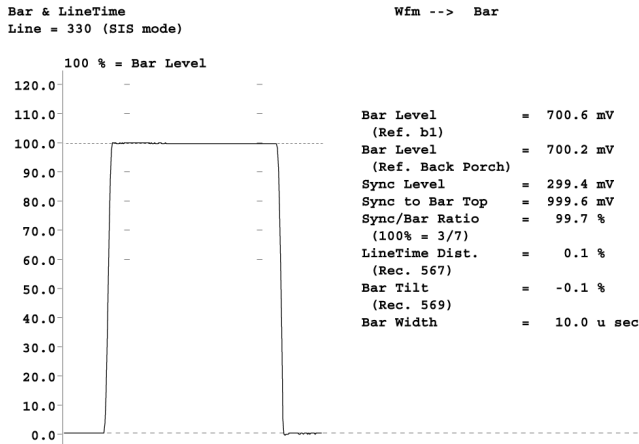
Characteristics

The performance requirements cited in this section are valid only within the following environmental limits:

- Temperature range of 0 to 50 °C, with a minimum warm-up time of 20 minutes. The following tables list each measurement and its performance requirement
- The range specifies the extremes between which a measurement can be made
- All measurement accuracies specified are valid only with nominal input signals of 1 V_{pp} (±6 dB) with an unweighted signal-to-noise ratio of at least 60 dB on the incoming signal and a termination accuracy of ±0.025% (Tektronix PN 011-0102-xx or equivalent)

Measure Mode*1, 2

*1 All accuracies for measurements with averaging capabilities assume the default average of 32.
 *2 All accuracies for measurements relative to reference mode assume an average of 256 was used to create the reference.



Average 32 -> 32

Bar line time measurement.

Bar Line Time

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Bar Level (b1 or back porch)	300 mV to 1.4 V	±0.5%	±0.2%
Sync Level	50 mV to 600 mV	±0.5%	±0.2%
Sync to Bar Top	350 mV to 2 V	±0.5%	±0.2%
Sync/Bar Ratio	10 to 125%	±0.5%	±0.2%
	100% nominal		
Bar Tilt (Rec 569)	0 to 20%	±0.2%	±0.1%
Line Time Distortion (Rec 567)	0 to 20%	±0.2%	±0.1%
Bar Width	10 μS to 30 μS	±100 nS	NA

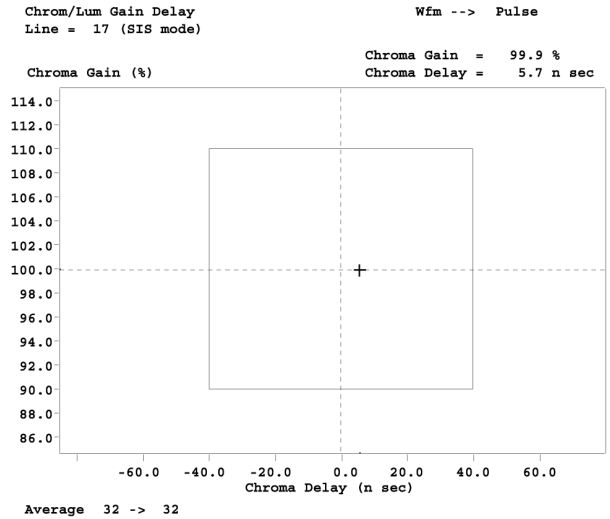
Bounce

Measurement	Range	Accuracy
Peak Deviation	0 to 50%	±1%
Settling Time	0 to 10 s	±100 ms

Burst Frequency*3

Measurement	Range	Relative Mode Accuracy
Burst Frequency Error	±100 Hz	±0.5 Hz

*3 Requires a reference signal.



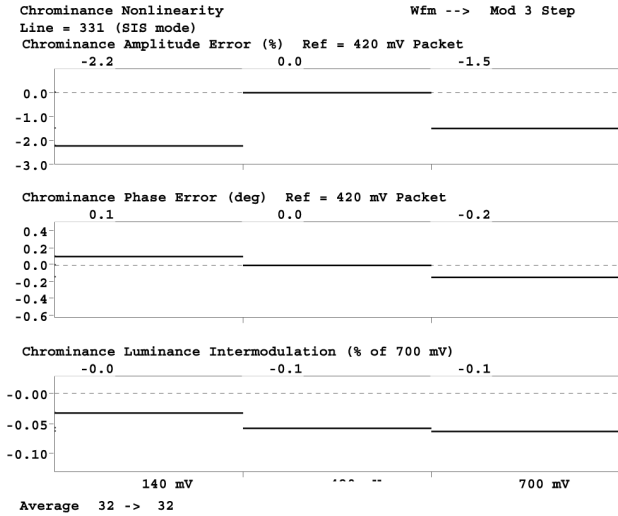
Chrominance-to-Luminance gain and delay measurement.

Chrominance-to-Luminance

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Chrominance-to-Luminance Delay	±300 ns	±5 ns	±1.0 ns
Chrominance-to-Luminance Gain Ratio	0 to 160%	±1.0%	±0.1%

Chrominance Noise

Measurement	Range	Absolute Mode Accuracy
AM Noise	-20 to -80 dB	±1 dB (-20 to -60 dB)
PM Noise	-20 to -70 dB	±1 dB (-20 to -60 dB)

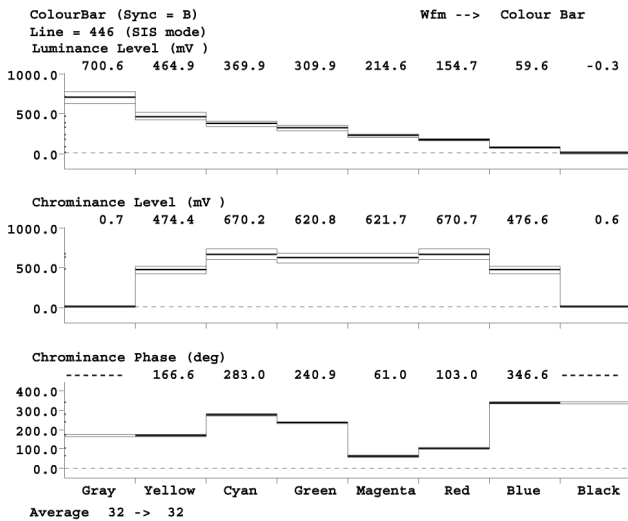


Chrominance nonlinearity measurement.

Chrominance Nonlinearity*4

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Chrominance Amplitude	0 to 100%	±0.4%	±0.2%
Chrominance Phase	0 to 360°	±1°	±0.2°
Chrominance-to-Luminance Intermodulation	-50 to +50%	±0.2%	±0.2%

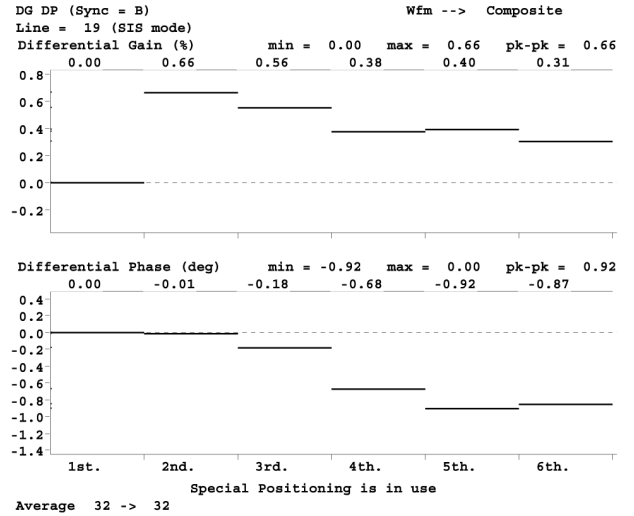
*4 Accuracies for chrominance nonlinearity amplitude and phase measurements assume an average of 256.



Color bar measurement.

Color Bar

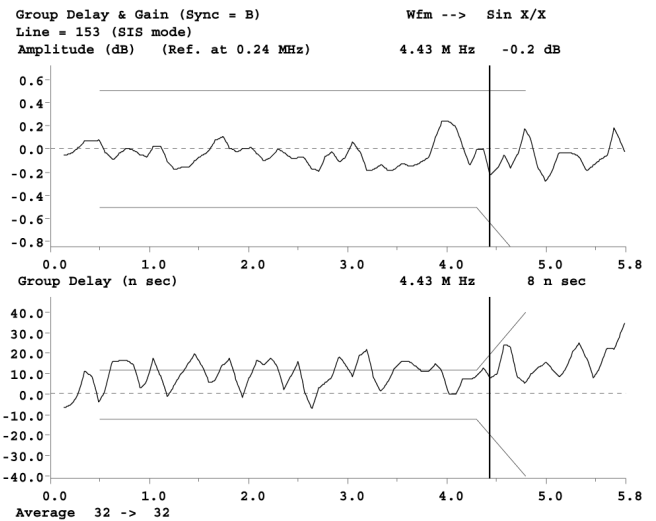
Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Luminance Level	0 to 700 mV	±3.5 mV	±0.2%
Chrominance Level (excluding gray and black)	0 to 700 mV	±1.0% of nominal	±0.2%
Chrominance Phase	±180°	±0.5°	±0.1°



Differential gain and phase measurement.

Differential Gain and Phase

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Differential Gain (Minimum, Maximum, and Peak)	0 to 100%	±0.3%	±0.03%
Differential Phase (Minimum, Maximum, and Peak)	0 to 360°	±0.3°	±0.03°



Frequency response and group delay measurement using Sin x/x.

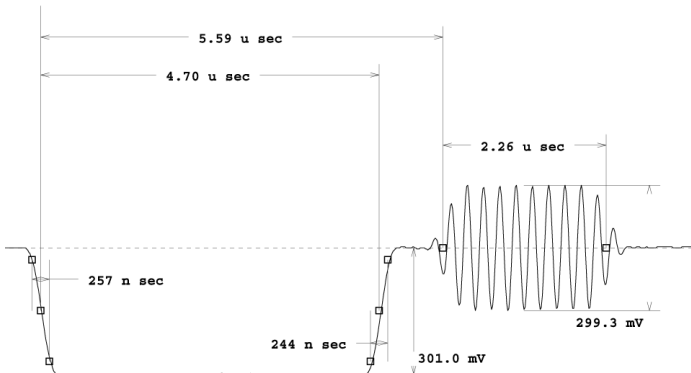
Frequency Response and Group Delay

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Frequency Response	±40 dB	±1.0 dB	±0.3 dB to 5 MHz
	±40 dB	±2.0 dB	±0.6 dB to 6 MHz
Group Delay	±1.0 µs	±20 ns	±5 ns to 5 MHz
	±1.0 µs	±40 ns	±10 ns to 6 MHz

Horizontal Blanking

Measurement	Range	Absolute Mode Accuracy
Blanking Start	0.1 to 4.2 μ s	± 50 ns
Blanking End	6.8 to 12.2 μ s	± 50 ns
Blanking Width	6.9 to 16.4 μ s	± 50 ns

H Timing (Sync = B)
Line = 153 (SIS mode)



Average 32 -> 32

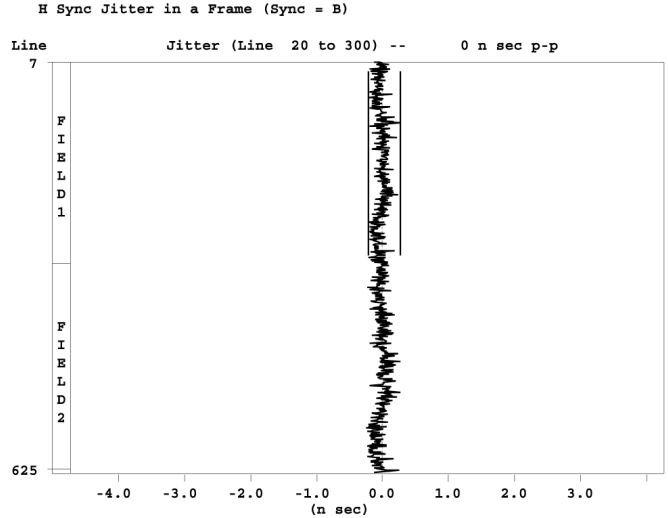
Horizontal timing measurement.

Horizontal Timing

Measurement	Range	Absolute Mode Accuracy
Burst Level	80 to 600 mV	$\pm 1\%$
Horizontal Sync Rise and Fall Time	80 ns to 1 μ s	± 10 ns
Horizontal Sync Width	1 to 8 μ s	± 10 ns
Burst Width	1.4 to 3 μ s	± 25 ns
Sync to Burst Start	5 to 8 μ s	± 25 ns
Sync Level	75 to 600 mV	$\pm 0.5\%$

Incidental Carrier Phase Modulation

Measurement	Range	Accuracy
ICPM (requires zero Carrier Pulse and the quadrature output of the Channel C)	0 to 90°	$\pm 1.0^\circ$



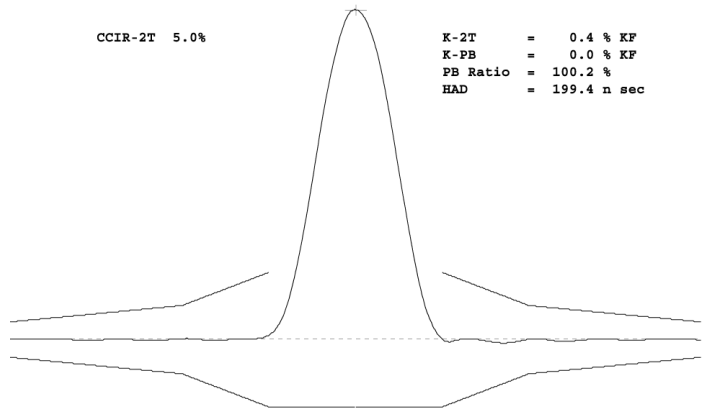
H_Jitter.

Jitter

Measurement	Range	Absolute Mode Accuracy
Jitter (2 field)	± 20 μ s	± 10 ns
Jitter Long Time	± 20 μ s	± 10 ns

2T Pulse K Factor (Sync = B)
Line = 330 (SIS mode)

Wfm --> Pulse & Bar



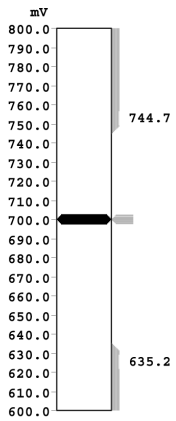
Average 32 -> 32

K-Factor measurement.

K-Factor

Measurement	Range	Absolute Mode Accuracy
2T Pulse K-Factor	0 to 10% Kf	$\pm 0.3\%$
KPB	-10 to +5% KPB	$\pm 0.3\%$
Pulse to Bar Ratio	10 to 125%	$\pm 0.7\%$
Pulse Half Amplitude Duration (HAD)	100 to 500 ns	± 5 ns

Level Meter (Sync = B)
Line = 330 (SIS mode)



#000

Level (b-a)
= 700.0 mV

(a) at 9.6 u sec, (b) at 17.1 u sec

Average Off

Level meter measurement.

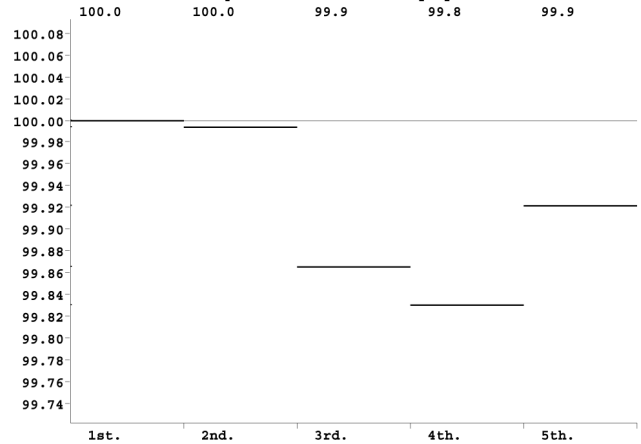
Level Meter

Measurement	Range	Accuracy
Level Meter	0 to 1.4 V	±3.5 mV

Line Frequency

Measurement	Range	Accuracy
Line Frequency	±3%	±0.1%
Field Frequency	±3%	±0.1%

Luminance Non Linearity (Sync = B) Wfm --> Composite
Line = 330 (SIS mode)
Luminance Non Linearity (%) pk-pk = 0.2

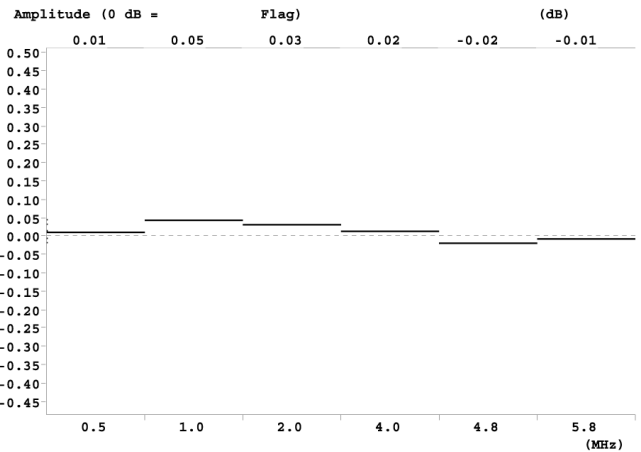


Luminance nonlinearity measurement.

Luminance Nonlinearity

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Luminance Nonlinearity	0 to 100%	±0.4%	±0.2%

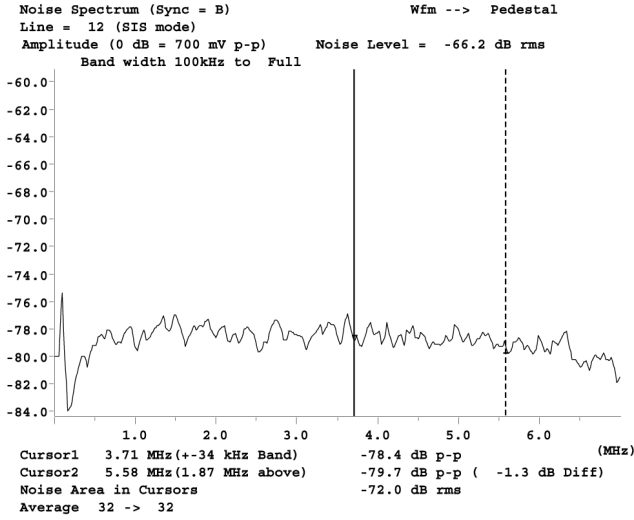
Multi Burst (Sync = B) Wfm --> Multi Burst
Line = 18 (SIS mode)



Multiburst measurement.

Multiburst

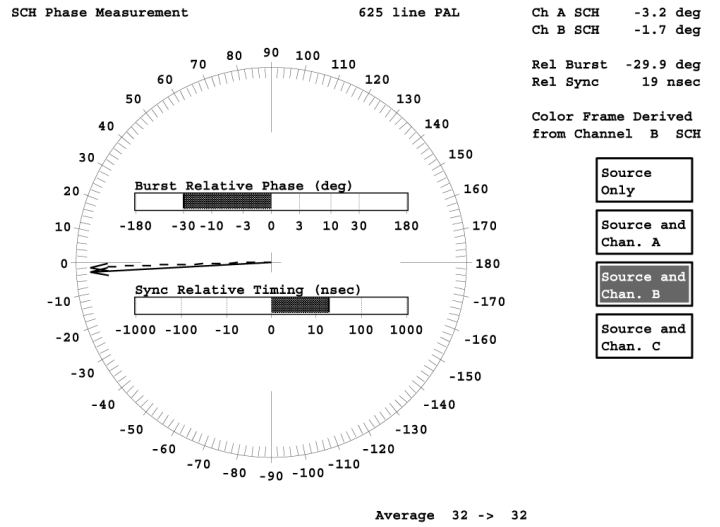
Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Multiburst Flag Amplitude	0 to 700 mV	±0.5%	NA
Packets 1-5 (0.5, 1.0, 2.0, 4.0, 4.8 MHz)	-40 to +6 dB	±0.1 dB	±0.03 dB
Packet 6 (5.8 MHz)	-40 to +6 dB	±0.2 dB	±0.06 dB



Noise spectrum measurement.

Noise Spectrum

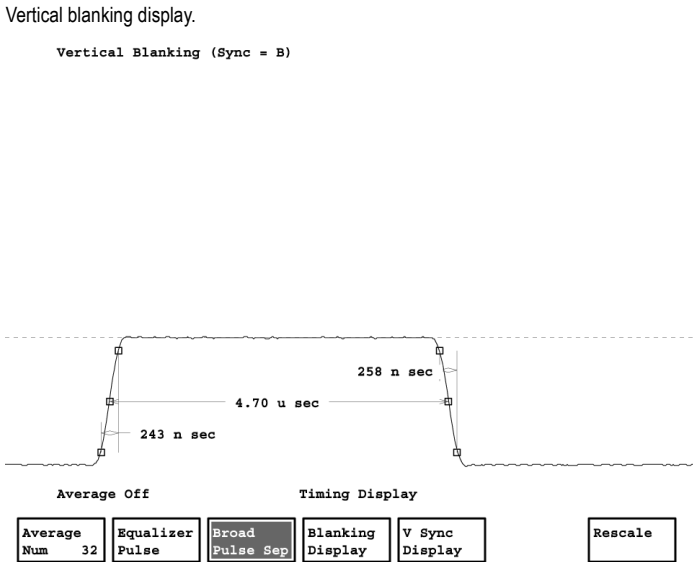
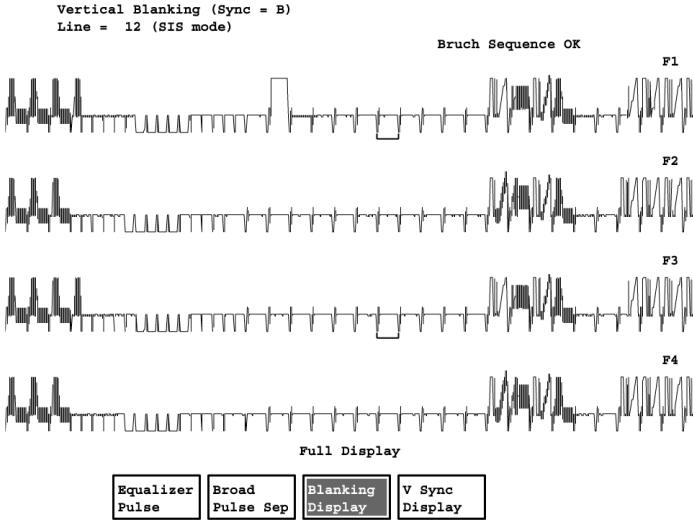
Measurement	Range	Absolute Mode Accuracy
Unweighted Signal-to-Noise	-20 to -80 dB	±0.4 dB (5 MHz Low Pass) (-20 to -60 dB) ±1.0 dB (-60 to -70 dB)
Luminance Weighted	-20 to -80 dB	±1.0 dB (5 MHz Low Pass and Signal-to-Noise) (-20 to -60 dB Unified Weighting) ±2.0 dB (-60 to -70 dB)
Chrominance Weighted	-20 to -80 dB	±1.0 dB Signal-to-Noise (-20 to -60 dB) ±2.0 dB (-60 to -70 dB)



SCH phase measurement.

SCH Phase

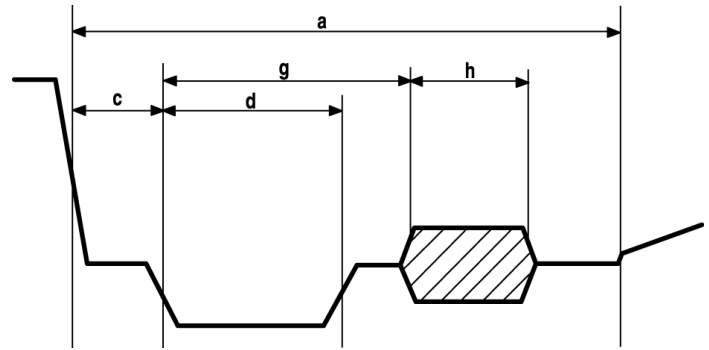
Measurement	Range	Absolute Mode Accuracy
SCH Phase	±90°	±5°
Sync Timing	±1 µS	±10 nS
Burst Timing	±180°	±5°



Vertical Blanking

Measurement	Range	Absolute Mode Accuracy
Equalizing Pulse	80 ns to 1 μ s	± 10 ns width
	80 ns to 1 μ s	± 10 ns
Broad Pulse Width	80 ns to 1 μ s	± 10 ns
Vertical Blanking	19 to 30 lines	NA Field 1
	19 to 30 lines	NA
Vertical Blanking	19 to 30 lines	NA Field 2
	19 to 30 lines	NA

Auto Mode

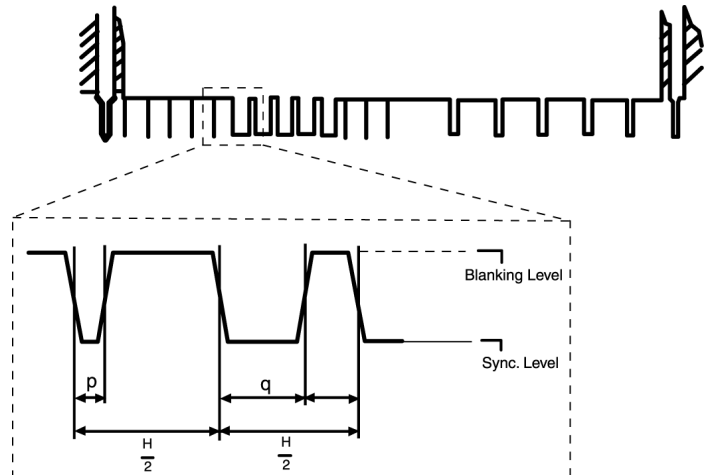


Line blanking timing waveform measurements.

Line Blanking Timing Measurements

These measurements are all made on samples acquired from the live signal area. With the exception of Line Sync Rise Time and Fall Time, these measurements are made in accordance with CCIR Report 624-1.

Measurement	Range	Accuracy
Color Burst Duration	6 to 13 cycles (10 cycles nominal)	± 0.1 cycle
Front Porch Duration	0.5 to 3 μ s (1.5 μ s nominal)	± 20 ns
Line Blanking	9 to 16 μ s (12 μ s nominal)	± 50 ns
Line Sync Rise and Fall Times	120 to 300 ns	± 15 ns
	300 ns to 1 μ s	± 30 ns
Line Sync	1.4 to 6.6 μ s (4.7 μ s nominal)	± 10 ns
Sync-to-Start of Burst	2.2 to 8 μ s (5.6 μ s nominal)	± 20 ns
Burst Duration	1.4 to 3 μ s	± 25 ns
SCH Phase	$\pm 90^\circ$	$\pm 5^\circ$



Field blanking timing waveform measurements.

Field Blanking Timing Measurements

Measurement	Range	Accuracy
Equalizing Pulse Duration	1.4 to 20 μ s (2.35 μ s nominal)	± 10 ns
Broad Pulse Separation	1.4 to 20 μ s (4.7 μ s nominal)	± 10 ns

Other Timing Measurements

Measurement Standard	Range	Accuracy	ITS Element
Bar Rise Time	120 to 300 ns	±20 ns	B2 measured from 10% to 90%
	0.3 to 1.0 µs	±30 ns	

Amplitude and Phase Measurements

Measurement	Range	Accuracy	ITS Element	Standard
Average Picture Level	0 to 200%	±3%		
Sync Amplitude Error	+100 to -50% (300 mV nominal)	±0.5% of nominal	Live picture area	CCIR Rec. 569
Sync Amplitude Error (with Sound-in-sync)	+100 to -50% (300 mV nominal)	±0.3% of nominal	Last broad pulse in field	CCIR Rec. 569
Burst Amplitude Error	+80 to -50% (300 mV nominal)	±1.0%	Live picture area	CCIR Rec. 569
Chrominance Reference Amplitude Error	-80 to +50% (300 mV nominal)	±1.0%	D2	CCIR Rec. 569
Luminance Bar Amplitude Error	+30 to -70% (700 mV nominal)	±0.3%	B2	CCIR Rec. 569
Luminance Bar Amplitude	200 to 900 mV	±2.2 mV	B2	
Luminance Bar Amplitude (% of carrier)	0 to 90% of Maximum Carrier	±0.3%	B2 and Zero Carrier	
Residual Carrier (Bar Top)	0 to 90% of Maximum Carrier	±0.3%	B2 and Zero Carrier	
Blanking Level	0 to 90% of Zero Carrier	±0.2%	Live picture area	CCIR Rep. 624-1
Chrominance-Luminance Gain Inequality	±75% of bar amplitude	±1.0%	G1 or G2	CCIR Rec. 569
Chrominance-Luminance Delay Inequality	±300 ns (0 ns nominal)	±5 ns	F or G1 or G2	CCIR Rec. 569
Sync/Bar Rel. 3/7	20 to 110%	±0.5%	B2	CCIR Rec. 569
Sync to Bar Top	0.5 to 2 V	±0.5%	B2	CCIR Rec. 569
C/L Gn Err ±50% (using modulated pulse)		±1%	F	
Sync Amplitude	75 to 600 mV	±1.5 mV		
Burst Amplitude	75 to 600 mV	±3 mV		
Burst Amplitude Difference		±2%		
Burst Quadrature Error		±1°		
Differential Gain (Peak and Peak-to-Peak)	0 to +100% (0% nominal)	±0.3%	D2	CCIR Rec. 569
Differential Phase (Peak and Peak-to-Peak)	0 to 360° (0° nominal)	±0.3°	D2	CCIR Rec. 569

Frequency Response Measurements

Measurement	Range	Accuracy	ITS Element	Standard
Multiburst Flag Amplitude	20 to 130% of bar (60% nominal)	±0.5%	C1	CCIR Rec. 567
Multiburst Amplitude	0 to 200% of flag	±1.5% of flag (±2.5% of 5.8 MHz packet)	C2	CCIR Rec. 567

Waveform Distortion Measurements

Measurement	Range	Accuracy	ITS Element	Standard
Baseline Distortion	50% of bar	±0.3%	B1	CCIR Rec. 569
2T Pulse/Bar Ratio Error	+25 to -90% (0% nominal)	±0.5%	B1	CCIR Rec. 569
2T Pulse K-Factor	0 to 10% Kf (0% Kf nominal)	±0.3% Kf	B1	CCIR Rec. 569
Bar Tilt (End Points)	0 to 40% (0% nominal)	0.20%	B2	CCIR Rec. 567
Bar Tilt (Peak-to-Peak)	0 to +40% (0% nominal)	±0.2%	B2	CCIR Rec. 567
Line Time Distortion	0 to 40% of bar	±0.2%	B2	CCIR Rec. 560
Bar Tilt (Rec 569)	0 to 40% of bar	±0.2%	B2	CCIR Rec. 569
Field Time Distortion	0 to 35%	±0.5%	Field Square Wave	
Chrominance-Luminance Intermodulation	±50% (0% nominal)	±0.2%	G1 or G2	CCIR Rec. 569
Luminance Nonlinear Distortion	0 to 50% (0% nominal)	±0.4%	D1	CCIR Rec. 569

Low Frequency Error

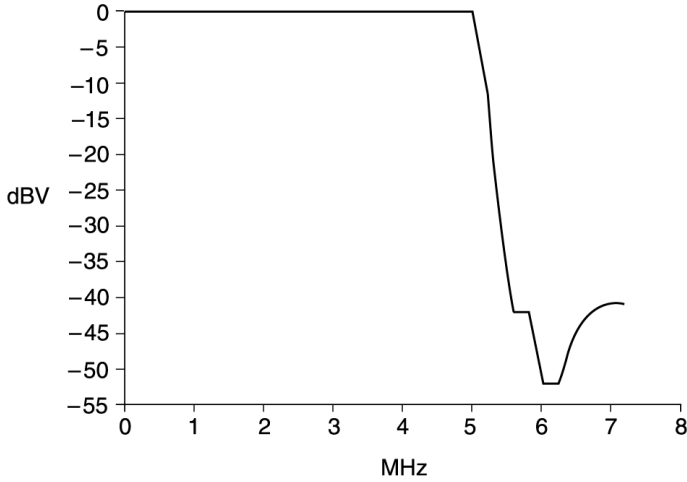
Measurement	Range	Accuracy	Standard
Low Frequency Error (Reported as: CCIR LF Error 50-550 Hz LF Error 10-1000 Hz LF Error)	0% to 25% (0% nominal)	±0.8%	CCIR Rec. 569

Noise Measurements

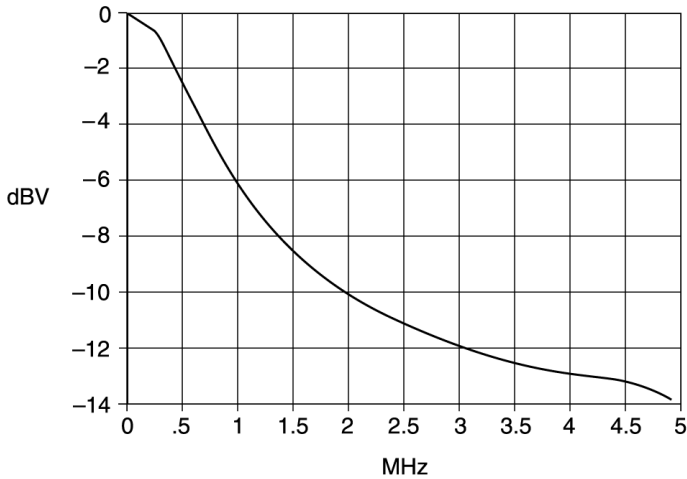
Measurement	Range	Accuracy	Standard
Unweighted SNR	26 to 60 dB	±1.0 dB	Measured on one quiet line per CCIR Rec. 567
	61 to 70 dB	±2.0 dB	
Luminance Weighted SNR	26 to 60 dB	±1.0 dB	Measured on one quiet line per CCIR Rec. 567
	61 to 70 dB	±2.0 dB	
Chrominance Weighted SNR	26 to 60 dB	±1.0 dB	Measured on one quiet line per CCIR Rep. 637-2
	61 to 70 dB	±2.0 dB	
Periodic SNR	26 to 60 dB	±1.0 dB	Measured on one quiet line per CCIR Rep. 637-2
	61 to 70 dB	±2.0 dB	
Unweighted SNR	26 to 60 dB	±1.0 dB	Measured on one quiet line per CCIR Rec. 569
	61 to 70 dB	±2.0 dB	
Luminance Weighted SNR	26 to 60 dB	±1.0 dB	Measured on one quiet line per CCIR Rec. 569
	61 to 70 dB	±2.0 dB	

Incidental Carrier Phase Modulation

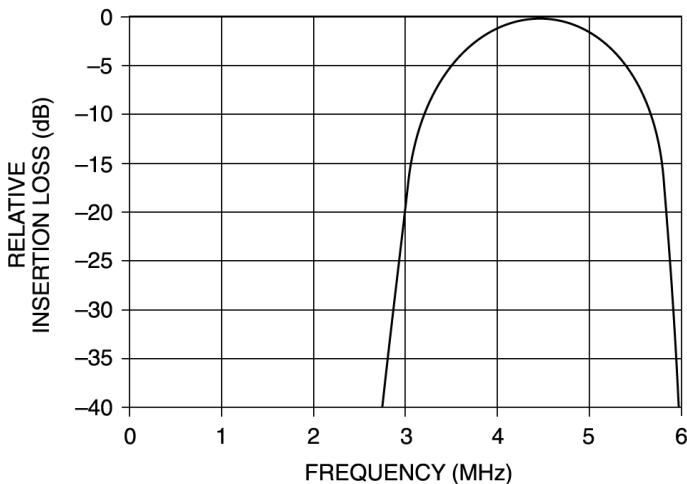
Measurement	Range	Accuracy
ICPM (requires zero Carrier Pulse and the quadrature output of the demodulator on Channel C)	0 to 30°	±1.0°



Unified unweighted filter response curve per CCIR recommendation 567.



Unified Luminance weighted filter response curve per CCIR recommendation 567.



Chrominance weighting filter response curve per CCIR report 637-2.

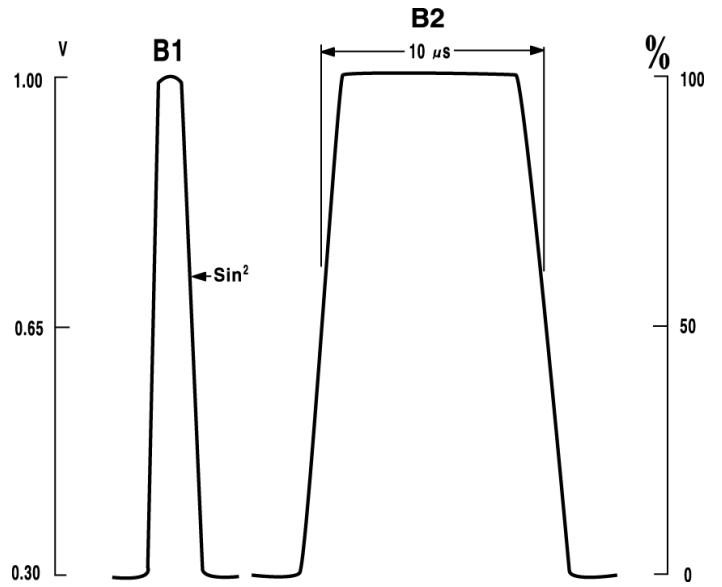
VM700T Video Measurement Set

Channel A System Default 07-Aug-95 19:05:58

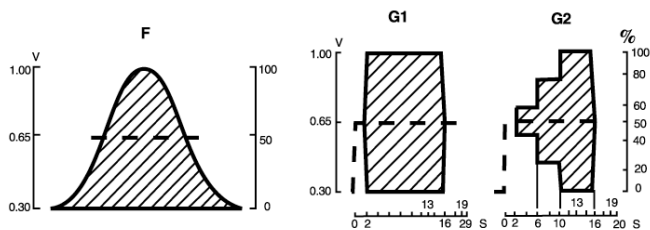
VM700T Video Measurement Set Violated Limits Lower Upper

System Default	Measurement	Unit	Lower	Upper	Limit
Source ID	----	----	----	----	Not Found
Luminance Bar Appl	702.8	%	---	---	Not Found
Luminance Bar Regl	----	1 Carr **	55.0	73.0	No Zero-C Pulse
Line Bar Appl Err	0.4	1 Bar	---	---	
Line Time Distortion	0.1	1 Bar	---	---	
Bar Pitt (Mod 567)	-0.2	1 Bar	---	---	
Bar Side Line	194.2	no	---	---	
Baseline Distortion	-0.1	1 Bar	---	---	
Blanking Level	100.2	1 Carr **	69.0	79.0	No Zero-C Pulse
Synchr. (Sw 1/7)	1004.4	%	---	---	
Synchr to Bar Top	----	----	----	----	
Pulse/Bar Ratio Err	0.1	1 Bar	---	---	
2:1 Pulse Relation	0.1	1 Bar	---	---	
C/L On Err (Mod Bar)	0.4	1 Bar	---	---	
Chr/Lum Delay Time	4.4	1 Bar	---	---	
C/L On Err (Mod Pla)	0.2	1 Bar	---	---	
Lum. Modulo. Dist.	----	----	----	----	At 43% APL
Chron Ref Appl Err	-0.1	1	---	---	
Pk-Pk Diff Gain	0.2	1	---	---	At 43% APL
Peak Diff Gain	0.1	1	---	---	At 43% APL
Pk-Pk Diff Phase	0.8	Deg	---	---	At 43% APL
Peak Diff Phase	0.2	Deg	---	---	At 43% APL
Chr/Lum Intermod	-0.0	1 Bar	---	---	
Synchr Amplitude	302.1	%	---	---	
Synchr Error	0.7	1	---	---	
Residual Carrier	----	1 Carr **	7.5	15.0	No Zero-C Pulse
Synchr-to-Burst Start	5.59	us	---	---	
Burst Duration	2.26	us	---	---	
Burst Duration	10.0	Cycles	---	---	
Burst Amplitude	308.8	%	---	---	
Burst Appl Error	0.3	1	---	---	
Burst Top Diff	-0.0	Deg	---	---	
Burst Peak Error	-2.7	Deg	---	---	
Synchr Duration	4.70	us	---	---	
Synchr Pulse Time	25.1	ns	---	---	
Synchr Fall Time	241.9	ns	---	---	
Front Porch	1.23	us	---	---	
Line Blanking	12.29	us	---	---	
Broad Pulse Sep.	4.70	us	---	---	
Equalizing Pulse	0.35	us	---	---	
Multiburst Flag	60.0	1 Flag	---	---	
Multiburst Flag	422.0	%	---	---	
HB Packet #1	100.0	1 Flag	---	---	
HB Packet #2	100.0	1 Flag	---	---	
HB Packet #3	101.0	1 Flag	---	---	
HB Packet #4	100.1	1 Flag	---	---	
HB Packet #5	100.0	1 Flag	---	---	
HB Packet #6	100.4	1 Flag	---	---	
CCIR LF Error	0.3	1 Bar	---	---	
50-50 Hz LF Error	0.4	1 Bar	---	---	
10-1000 Hz LF Error	0.3	1 Bar	---	---	
S/N Unweighted (567)	67.9	dB	---	---	
S/N Low-vgd (567)	71.3	dB	---	---	
S/N Char-vgd (567)	72.5	dB	---	---	
S/N Periodic (569)	60.0	dB	** 40.0	-----	Random >> Periodic
S/N Unweighted (569)	76.9	dB	---	---	
S/N Low-vgd (569)	76.9	dB	---	---	
S/N Char-vgd (567)	67.8	dB	---	---	
S/N Low-vgd (567)	73.6	dB	---	---	
S/N Char-vgd (569)	72.3	dB	---	---	
S/N Low-vgd (569)	89.4	dB	---	---	
S/N Char-vgd (569)	76.3	dB	---	---	
ICM (Absolute)	-----	Deg **	-20.0	20.0	No Zero-C Pulse
ICM (Sec. Blanking)	-----	Deg **	-20.0	20.0	No Zero-C Pulse
Field Time Dist	-----	1 **	-2.0	2.0	Not Found

Measurement results are displayed in an easy-to-read format indicating the time, signal source, measurement, and whether the measured value exceeded caution (*) or alarm (**) limits.



Elements B1 and B2 (CCIR recommendation 567).



Element F, G1, and G2 (CCIR Recommendation 567).

Measurement Methods

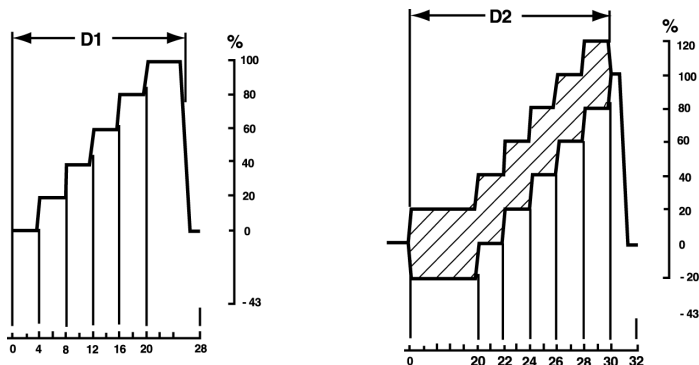
The following paragraphs specify the methods for each Opt. 11 measurement. Where appropriate, reference is made to the relevant CCIR recommendation.

Line Blanking Timing Measurements

- **Color Burst Duration:** Measured between the half-amplitude points of the burst chrominance envelope. Result expressed as the number of cycles between the half-amplitude points. See duration "h" in waveform diagram. CCIR Report 624-1.
- **Front Porch Duration:** Measured from the half-amplitude point between peak white-level and blanking to the half-amplitude point of the leading edge of sync. See duration "c" in waveform diagram. CCIR Report 624-1.
- **Line Blanking Interval:** Measured from the half-amplitude point between peak white-level and blanking at the front porch to the half-amplitude point between blanking level and peak white level at the back porch. See duration "a" in waveform diagram. CCIR Report 624-1.
- **Line Sync Rise and Fall Time (Build-up Times):** Measured between the 10% point and the 90% point of the line-synchronizing pulse leading edge (rise time) and trailing edge (fall time).
- **Line Sync Width:** Measured between the half-amplitude points on the leading edge and trailing edge of sync. See duration "d" in waveform diagram. CCIR Report 624-1.
- **Sync-to-Start of Burst:** Measured from the half-amplitude point of the leading edge of sync to the half-amplitude point of the leading edge of the burst chrominance envelope. See duration "g" in waveform diagram. CCIR Report 624-1.

Field Blanking Timing Measurements

- **Equalizing Pulse Duration:** Measured between the half-amplitude points of the leading edge and trailing edge of the equalizing pulse. See duration "p" in waveform diagram. CCIR Report 624-1, Figure 2-1 (a), (b), and (c).
- **Broad Pulse Duration:** Measured between the half-amplitude points of the leading edge and trailing edge of the broad pulse. See duration "q" in waveform diagram. CCIR Report 624-1, Figure 2-1 (a), (b), and (c).



Element D1 and D2 (CCIR Recommendation 569).

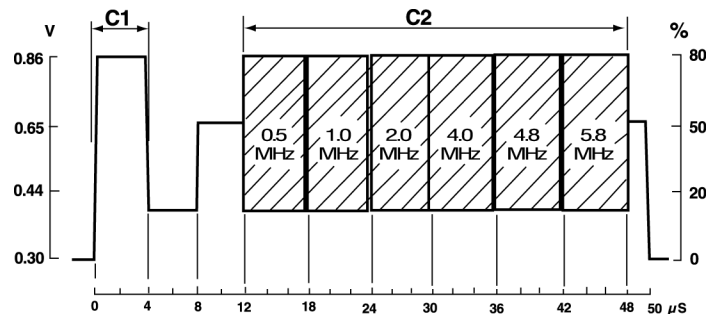
Other Timing Measurements

- **Bar Rise Time:** Measured between the 10% and 90% points on the leading edge of bar. See element B2.

Amplitude and Phase Measurements

- **Sync Amplitude Error:** Measured as the difference between the sampled sync pulse amplitude and a nominal 300 mV amplitude. Result expressed as a % of the nominal 300 mV. Sign is positive if the sampled sync pulse amplitude is greater than 300 mV.
- **Burst Amplitude Error:** Measured as the difference between the sampled peak-to-peak amplitude at the center of burst and a nominal 300 mV amplitude. Result expressed as a % of the nominal 300 mV amplitude. Sign is positive if the sampled peak-to-peak burst amplitude exceeds 300 mV.
- **Chrominance Reference Amplitude Error:** Measured as the difference between the sampled peak-to-peak amplitude of the blanking-level chrominance packet and the normalized value (0.4 of the measured bar amplitude). Result expressed as % of the normalized value. Sign is positive if the sampled peak-to-peak amplitude exceeds 280 mV. See element D2 and CCIR Recommendation 569.
- **Luminance Bar Amplitude Error:** Measured as the % deviation of the sampled bar amplitude from a nominal value of 700 mV. Sign is positive if the sampled bar amplitude exceeds 700 mV. See element B2 and CCIR Recommendation 569.
- **Luminance Bar Amplitude:** The absolute amplitude of sampled bar. Result expressed as mV and % of Carrier (if Carrier is present). See element B2.
- **Bar Tilt Error:** Measured as the maximum departure of the bar top from the sampled bar amplitude at bar center, excluding the bar portion 1 μs past the bar leading edge half-amplitude point and 1 μs before the bar trailing edge half-amplitude point. The sign of the difference is always positive. Result expressed as a % of sampled bar amplitude. See element B2 and CCIR Recommendation 567.

- Blanking Level:** Measured as the mean level over 32 sampled lines of 16 samples centered around the back porch. Result expressed as % of Carrier. Not measured if Carrier not present in the vertical interval.
- 2T Pulse K-Factor:** Measured as the greatest weighted amplitude of a positive-going or negative-going echo-term half-wave which is within 1 μ s before the 2T pulse leading edge half-amplitude point or within 1 μ s after the 2T pulse trailing edge half-amplitude point. Result expressed as a K-Factor, which is the ratio of the weighted amplitude of the echo-term half-wave to the sampled amplitude of the 2T pulse. The weighting is based on the graticule shown in Figure 29a of CCIR Recommendation 567. See element B1.
- C/L Gain Inequality:** Measured as the difference between the sampled peak-to-peak amplitude of the 700 mV (nominal) chrominance packet (G1 or G2) and the sampled amplitude of the luminance bar (also nominally 700 mV). Result expressed as a % of sampled bar amplitude. Sign is positive if the chrominance amplitude is greater than the luminance amplitude. See element G1 or G2 and CCIR Recommendation 569.
- C/L Delay Inequality:** Measured as the time difference between the 10T or 20T composite pulse chrominance component center and the composite pulse luminance component center. Result expressed in nanoseconds. The sign of the result is positive if the chrominance component lags the luminance component. See element F and CCIR Recommendation 569.
- C/L Intermodulation:** Measured on a 350 mV pedestal, part of which has had chrominance packet superimposed and part of which has not. The result is the difference between the pedestal level under the chrominance packet after the chrominance has been filtered out and the pedestal level where no chrominance pedestal was superimposed. Result expressed as a % of sampled bar amplitude. Sign is positive if the level of the pedestal which was under the chrominance is greater than the other level. See element G1 or G2 and CCIR Recommendation 569.
- Differential Gain:** Measured as peak-to-peak differential gain. The 5-riser staircase chrominance packet with the greatest peak-to-peak amplitude is found and the ratio of that amplitude to the peak-to-peak amplitude of the blanking level chrominance packet is determined and subtracted from unity. A similar ratio is determined using the packet with the least peak-to-peak amplitude and that ratio is subtracted from unity. The measurement result is the sum of the two differences. See element D2 and CCIR Recommendation 569.
- Differential Phase:** Measured as peak-to-peak differential phase. The maximum phase difference (absolute value) between a 5-riser staircase chrominance packet and the blanking-level chrominance packet is determined. Likewise, the minimum phase difference (absolute value) is determined. The measurement result is the sum of these two phase differences and is expressed in degrees. See element D2 and CCIR Recommendation 569.
- Luminance Nonlinear Distortion:** Measured by comparing the differences between adjacent pairs of the six luminance levels that make up the 5-riser staircase. The measurement result is the largest % deviation in adjacent step sizes. The sign is always positive. See element D1 and CCIR Recommendation 569.



Elements C1 and C2 (CCIR Recommendation 569).

Frequency Response Measurements

- Multiburst Flag Amplitude:** Measured from the center point of the flag top to the ensuing bottom of the flag. Result expressed as % of sampled bar amplitude. See element C1 and CCIR Recommendation 567.
- Multiburst Amplitude (Five Packets):** Measured as the peak-to-peak amplitude of each of the first five multiburst packets. The peak-to-peak amplitude is measured over a 4.5 μ s window at the center of the first two packets and over a 1.13 μ s window at the center of the next three packets. The last packet is not measured. Results expressed as % of sampled flag amplitude. See elements C1 and C2 and CCIR Recommendation 567.

Linear Waveform Distortion Measurements

- Baseline Distortion:** Measured as the difference between the signal level 400 ns after the half-amplitude point of the trailing edge of the bar and the signal level at blanking reference. The signal is first band-limited to 3.3 MHz. Result expressed as a % of sampled bar amplitude. Sign is positive if level nearest bar is highest. See CCIR Recommendation 569 (paragraph 2.4) and Figure 1.
- 2T Pulse/Bar Ratio Error:** Measured as the difference between the sampled amplitude of the 2T pulse and the sampled bar amplitude. The sign is positive if the 2T pulse amplitude is greater. Result expressed as a % of sampled bar amplitude. See elements B1 and B2 and CCIR Recommendation 569.

Low Frequency Error

- Low Frequency Error:** Measured as the peak-to-peak amplitude of the most extreme sampled fluctuations from black level that are in the frequency band between 10 Hz and 2 kHz. Expressed as a % of sampled bar.

ASEAN / Australasia (65) 6356 3900

Austria +41 52 675 3777

Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777

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Canada 1 (800) 661-5625

Central East Europe, Ukraine, and the Baltics +41 52 675 3777

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Italy +39 (02) 25086 1

Japan 81 (3) 6714-3010

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Mexico, Central/South America & Caribbean 52 (55) 54247900

Middle East, Asia, and North Africa +41 52 675 3777

The Netherlands 090 02 021797

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People's Republic of China 86 (10) 6235 1230

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Spain (+34) 901 988 054

Sweden 020 08 80371

Switzerland +41 52 675 3777

Taiwan 886 (2) 2722-9622

United Kingdom & Ireland +44 (0) 1344 392400

USA 1 (800) 426-2200

For other areas contact Tektronix, Inc at: 1 (503) 627-7111

Updated 5 August 2009

Ordering Information

VM700T Opt. 11

PAL Video Measurement Set.

Includes: Instruction manual, 75 Ω terminators (3) 011-0102-xx, power cord.

When ordering, please use the nomenclature given here. The standard instrument is shipped as a rackmount product.

Opt. 01 – NTSC Measurements.

Opt. 01/11 – Dual-standard Measurements.

Opt. 20 – Teletext Measurements.

Opt. 21 – Camera Measurements.

Opt. 30 – Component Measurements.

Opt. 40 – Audio Measurement Module.

Opt. 41 – 6-channel Audio Measurement Module.

Opt. 42 – Audio-to-Video Delay Measurement.

Opt. 48 – GPIB Interface.

Opt. 1C – Cabinet Version.

Opt. 1G – Echo/Rounding Measurements.

Opt. 1S – Serial Digital Video Measurements.

VM700T Software Utilities

VMBKUP – VM700T Backup Utility.

VMTWIN – VM700T Remote Control Software.

Optional Accessories

VM7FR1 – Field-installable conversion kit to convert cabinet to rackmount unit.

Service

Opt. C3 – Calibration Service 3 Years.

Opt. C5 – Calibration Service 5 Years.

Opt. D1 – Calibration Data Report.

Opt. D3 – Calibration Data Report 3 Years (with Opt. C3).

Opt. D5 – Calibration Data Report 5 Years (with Opt. C5).

Opt. R3 – Repair Service 3 Years.

Opt. R5 – Repair Service 5 Years.



Product(s) are manufactured in ISO registered facilities.

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06 Aug 2009

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