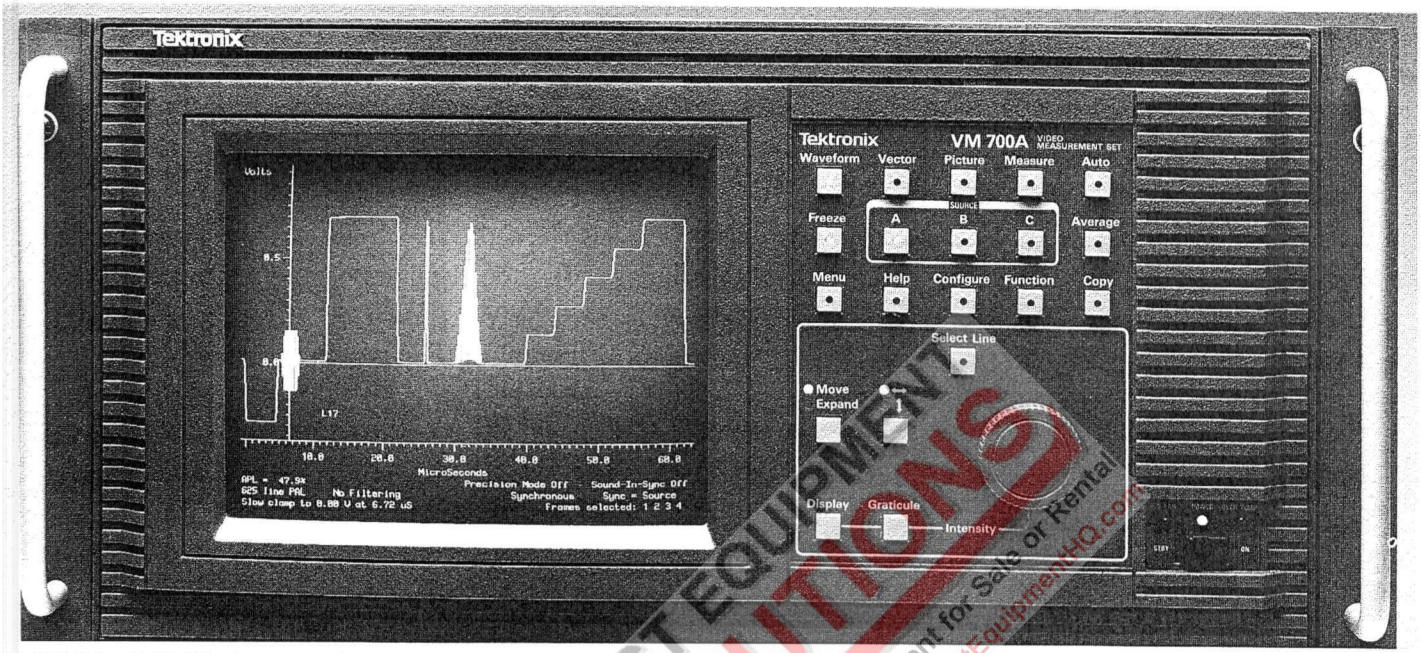
# VM 700A Option 11
# PAL Video Measurement Set

VM 700A
OPTION 11






VM 700A Option 11 PAL Video Measurement Set.

**Many capabilities in one instrument**

- Digital waveform monitor
- Digital vectorscope
- Group delay and frequency response
- Noise measurement set
- Automatic measurement set

**Auto mode**

- Unattended monitoring of PAL video signals from studios, STLs, Earth Stations, and transmitters
- User-specified limits

**Measure mode provides graphic display of measurements**

- K factor
- Differential gain and phase
- Luminance to chrominance delay
- Noise spectrum
- Group delay with (sin x)/x
- Color bars
- Relative to reference on most measurements
- Configurable for all standard test signals
- **Three input channels**
- **Channel difference modes**
- **Averaging on all measurement modes**
- **Picture mode for source ID**
- **Hardcopy for analysis and documentation**
- **Remote control operation**

The VM700A is a complete video monitoring and measuring instrument which can be used for automatic measurements and monitoring, as well as for manual measurements. The user can select a display of numeric values to confirm the quality of the signal path, or may select graphic displays for more detailed analysis.

**Automatic video measurement set**

The VM700A Auto Mode makes standard video measurements automatically, including those specified in CCIR Rep. 624-1, Rec. 567, and Rec. 569. These measurements can be compared with user-defined limits. A caution or alarm message is generated when these limits are violated. Reports can be made and printed automatically at operator scheduled times.

**Digital waveform monitor/vectorscope**

For a more detailed analysis of the waveform, the actual signal may be displayed and additional measurements made manually.

In Waveform Mode, cursors are available to aid in measuring time, frequency and amplitude. These cursors allow a very quick and precise location of the 10%, 50% and 90% points on any transition. Enabling cursors also enables an automatic calculation in the waveshape in the center of the dispay. 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 at all expansion factors. The scales automatically expand with the 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.

The 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 Colorbars" feature searches all video for colorbars 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.

**Graphic displays of measurements**

Measure Mode provides graphic displays of measurements such as noise spectrum, group delay, and K factor, for adjustments or closer analysis of the measurement. Most measurements can be made relative to a stored reference to eliminate or minimize signal source errors. Most measurements have averaging to reduce the effect of noise. A channel difference mode (A–B, A–C, and B–C) is also provided and is useful in input to output analysis of a device.

**Picture mode**

The signal source can be quickly verified using the picture display. Any line may be selected on the picture for viewing in the waveform or vector displays.

# VM 700A Option 11
# PAL Video Measurement Set

### User-programmable functions

The user can define a sequence of operations as a new function.

For example, the measurements to be made on a transmitter demodulator video output could be identified with a function labeled DEMOD. A user would simply select this function to make all measurements, and provide a printout.

The VM700A stores user defined functions as editable ASCII files.

### Hardcopy

All information on the screen may be printed on printers supporting PostScript®, Hewlett-Packard® LaserJet™, or 24-pin Epson® graphics via the standard RS-232C interface. Automatic measurement results can be printed on most ASCII printers using the same interface.

### Remote operation

The VM700A can be operated from a remote terminal via RS-232C to monitor unattended transmission systems and/or put systems under computer control. In addition, all files could be uploaded to a main computer, and downloaded to other VM700As. 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. However, file transfers can only take place with FTP.

### Specifications

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

Temperature range of 0 to 50 degrees Celsius, 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 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 011-0102-01 or equivalent).

Due to the statistical nature of digitizing measurement methods, reported results will meet these specifications 97% of the time.

### Measurement methods

The following paragraphs specify the methods for each Option 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.

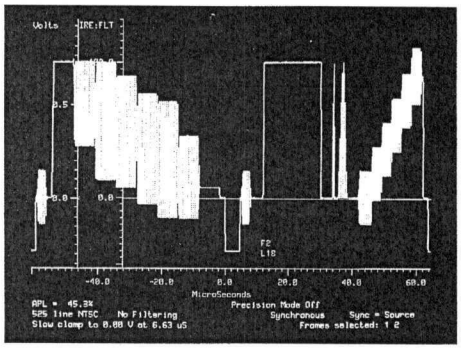
**Line Sync Rise and Fall Time (Build-up Times):** Measured between the 10% point and the 90% point of the line-synchronizing pulse leading edge (Rise Time) and trailing edge (Fall Time).

**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.

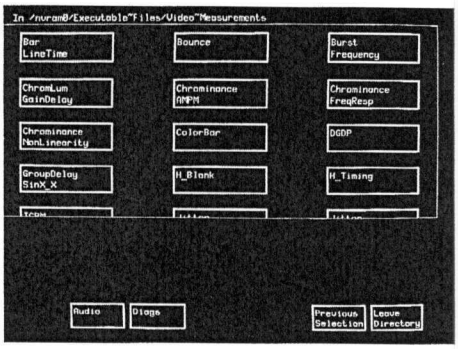
**Sync-to-Start of Burst:** Measured from the half-amplitude point of the leading edge of sync to the half-amplitude point of the leading edge of the burst chrominance envelope. See duration "g" in waveform diagram. CCIR Report 624-1.

### Field blanking timing measurements

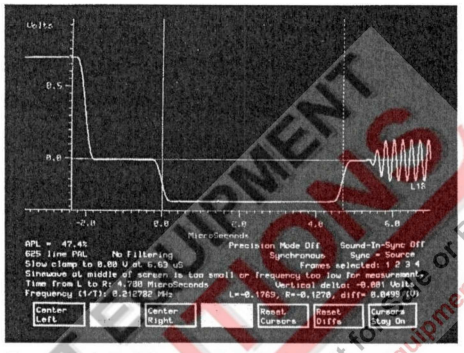
**Equalizing Pulse Duration:** Measured between the half-amplitude points of the leading edge and trailing edge of the equalizing pulse. See duration "p" in waveform diagram. CCIR Report 624-1, Figure 2-1 (a), (b), and (c).




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.

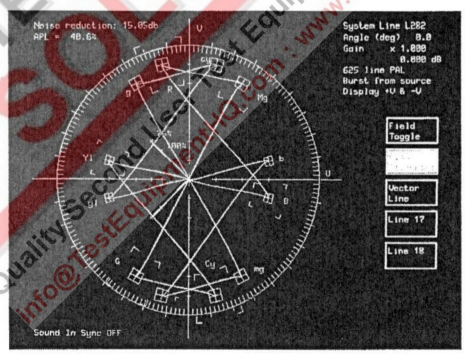



Main Measure Mode display of available measurements.

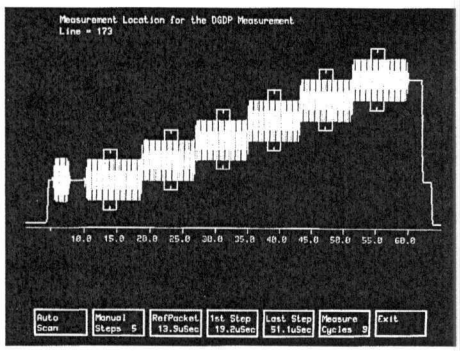



Even a single horizontal synchronization pulse can be displayed at a high intensity.


Picture Mode display. (Video courtesy of KOIN-TV, Portland, Oregon.)




In Vector Mode, the VM700A becomes a digital vectorscope with an electronic graticule. A "Color Bar Search" feature makes it easy to quickly display a line containing a color bar test signal.




Measure Mode DGDP special position acquisition feature.

# VM 700A Option 11
# PAL Video Measurement Set





**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).

**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 one microsecond past the bar leading edge half-amplitude point and one microsecond 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 one microsecond before the 2T pulse leading edge half-amplitude point or within one microsecond 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.

VM700A Video Measurement Set

Channel A System Default **03-Jan-94 11:06:26**

*System Default* — *VM700A Video Measurement Set*

| | | | | Violated Limits Lower | Upper | |
|---|---|---|---|---|---|---|
| Source ID | ---- | | | | | Not Found |
| Luminance Bar Ampl | 696.4 | mV | | | | |
| Luminance Bar Ampl | ------ | % Carr | ** | 55.0 | 73.0 | No Zero-C Pulse |
| Lum Bar Ampl Err | -0.5 | % | | | | |
| Line Time Distortion | 0.0 | % Bar | | | | |
| Bar Tilt (Rec 569) | 0.0 | % Bar | | | | |
| Bar Rise Time | 192.6 | ns | | | | |
| Baseline Distortion | -0.0 | % Bar | | | | |
| Blanking Level | ------ | % Carr | ** | 69.0 | 79.0 | No Zero-C Pulse |
| Sync/Bar (Rel 3/7) | 100.2 | % | | | | |
| Sync to Bar Top | 995.3 | mV | | | | |
| Pulse/Bar Ratio Err | 0.1 | % Bar | | | | |
| 2T Pulse K-factor | 0.4 | % Kf | | | | |
| C/L Gn Err (Mod Bar) | 0.4 | % Bar | | | | |
| Chr/Lum Delay Ineq | -0.4 | ns | | | | |
| C/L Gn Err (Mod Pls) | 0.1 | % Bar | | | | |
| Lum. Nonlin. Dist. | 0.1 | % | | | | At 54% APL |
| Chrom Ref Ampl Err | 1.1 | % | | | | |
| Pk-Pk Diff Gain | 0.3 | % | | | | At 54% APL |
| Peak Diff Gain | 0.3 | % | | | | At 54% APL |
| Pk-Pk Diff Phase | 0.1 | Deg | | | | At 54% APL |
| Peak Diff Phase | 0.1 | Deg | | | | At 54% APL |
| Chr/Lum Intermod | 0.1 | % Bar | | | | At 54% APL |
| Sync Amplitude | 298.9 | mV | | | | |
| Sync Ampl Error | -0.4 | % | | | | |
| Residual Carrier | ------ | % Carr | ** | 7.5 | 15.0 | No Zero-C Pulse |
| Sync-to-Burst Start | 5.60 | us | | | | |
| Burst Duration | 2.25 | us | | | | |
| Burst Duration | 10.0 | Cycles | | | | |
| Burst Amplitude | 300.2 | mV | | | | |
| Burst Ampl Error | 0.1 | % | | | | |
| Burst Ampl Diff | 0.0 | % | | | | |
| Burst Quad Error | -0.1 | Deg | | | | |
| SCH Phase | 2.1 | Deg | | | | |
| Sync Duration | 4.70 | us | | | | |
| Sync Rise Time | 245.4 | ns | | | | |
| Sync Fall Time | 246.8 | ns | | | | |
| Front Porch | 1.64 | us | | | | |
| Line Blanking | 12.03 | us | | | | |
| Broad Pulse Sep | 4.70 | us | | | | |
| Equalizing Pulse | 2.35 | us | | | | |
| Multiburst Flag | 60.0 | % Bar | | | | |
| Multiburst Flag | 418.2 | mV | | | | |
| MB Packet #1 | 100.0 | % Flag | | | | |
| MB Packet #2 | 100.0 | % Flag | | | | |
| MB Packet #3 | 99.9 | % Flag | | | | |
| MB Packet #4 | 100.2 | % Flag | | | | |
| MB Packet #5 | 100.0 | % Flag | | | | |
| MB Packet #6 | 98.8 | % Flag | | | | |
| CCIR LF Error | 0.1 | % Bar | | | | |
| 50-550 Hz LF Error | 0.2 | % Bar | | | | |
| 10-1000 Hz LF Error | 0.1 | % Bar | | | | |
| S/N Unweighted (567) | 79.3 | dB | | | | |
| S/N Lum-wgtd (567) | 85.5 | dB | | | | |
| S/N Chr-wgtd | 83.9 | dB | | | | |
| S/N Periodic | ------ | dB | ** | 40.0 | ------ | Random >> Periodic |
| S/N Unweighted (569) | 80.7 | dB | | | | |
| S/N Lum-wgtd (569) | 88.3 | dB | | | | |
| S/N.2 Unwgtd (567) | 80.1 | dB | | | | |
| S/N.2 Lum-wgtd (567) | 86.1 | dB | | | | |
| S/N.2 Chr-wgtd | 82.6 | dB | | | | |
| S/N.2 Unwgtd (569) | 80.6 | dB | | | | |
| S/N.2 Lum-wgtd (569) | 88.1 | dB | | | | |
| ICPM (Absolute) | ------ | Deg | ** | -20.0 | 20.0 | No Zero-C Pulse |
| ICPM (Rel Blanking) | ------ | Deg | ** | -20.0 | 20.0 | No Zero-C Pulse |
| Field Time Dist | 0.1 | % | | | | Full-Field Sq. Wave |



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.

# VM 700A Option 11
## PAL Video Measurement Set



**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 Non-linear 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.

**Frequency response measurements**

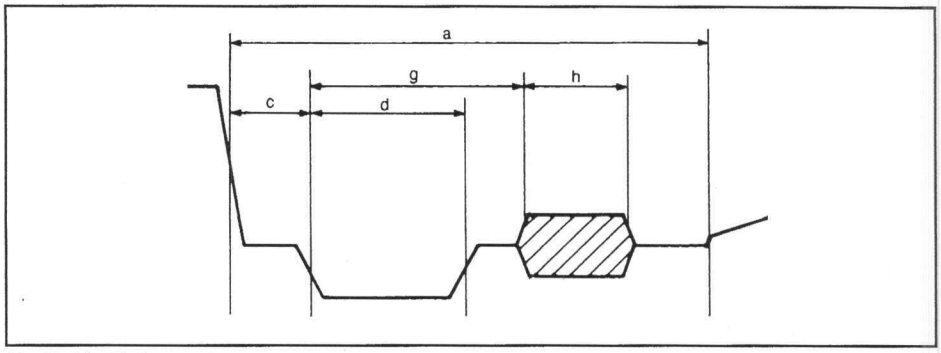
**Multiburst Flag Amplitude:** Measured from the center point of the flag top to the en-suing bottom of the flag. Result expressed as % of sampled bar amplitude. See element C1 and CCIR Recommendation 567.

**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 µsec window at the center of the first two packets, and over a 1.13 µsec 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.

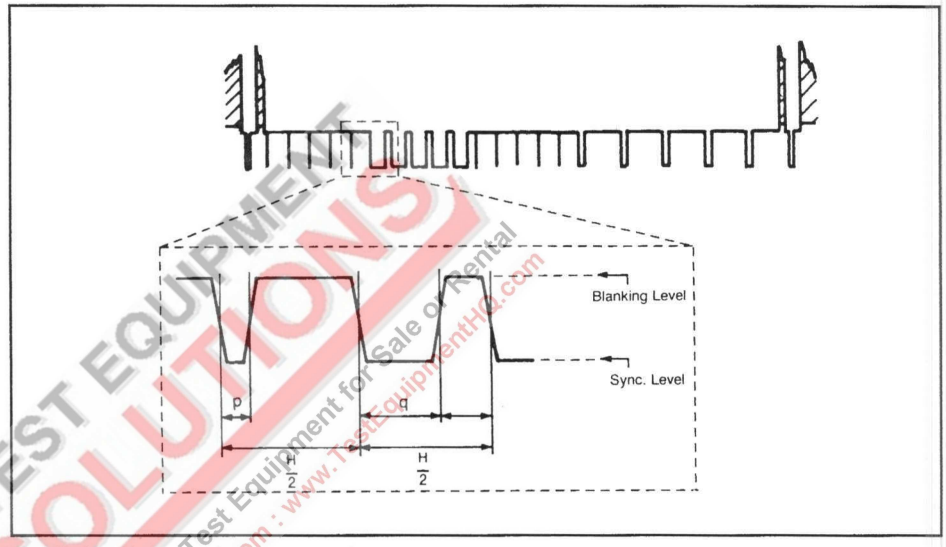
**Linear waveform distortion measurements**

**Baseline Distortion:** Measured as the difference between the signal level 400 nanoseconds 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.

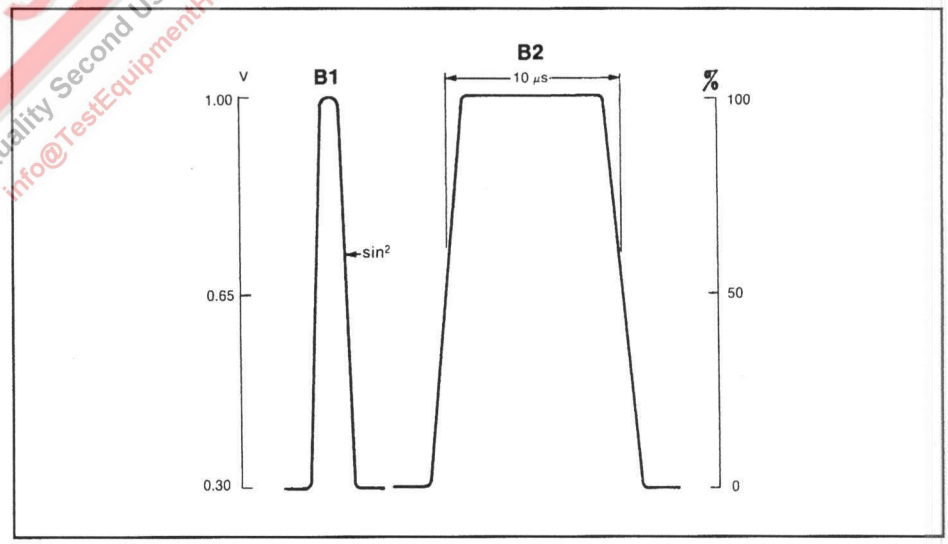
**2T Pulse/Bar Ratio Error:** Measured as the difference between the sampled amplitude of the 2T pulse and the sampled bar amplitude. The sign is positive if the 2T pulse amplitude is greater. Result expressed as a % of sampled bar amplitude. See elements B1 and B2 and CCIR Recommendation 569.




Line Blanking Timing waveform measurements.




Field Blanking Timing waveform measurements.




Elements B1 and B2 (CCIR Recommendation 567).

**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.

# VM 700A Option 11
# PAL Video Measurement Set





## CHARACTERISTICS

**MEASURE MODE**[1,2]
- Bar Line Time
- Bounce
- Burst Frequency[3]
- Chrominance To Luminance Gain And Delay
- Chrominance Frequency Response
- Chrominance Noise
- Chrominance Non-Linearity[4]
- Color Bar
- SMPTE Color Bars Nominal Values
- Differential Gain And Phase
- Frequency Response And Group Delay
- Horizontal Blanking
- Horizontal Timing
- Incidental Carrier Phase Modulation
- Jitter
- K Factor
- Line Frequency
- Luminance Non-Linearity
- Multiburst[5]
- Noise Spectrum
- SCH Phase
- Vertical Blanking

1 All accuracies for measurements with averaging capabilities assume the default average of 32.

2 All accuracies for measurements with relative to reference mode assume an average of 256 was used to create the reference.

3 Requires a reference signal.

4 Accuracies for chrominance non-linearity amplitude and phase

5 Total Harmonic Distortion on packets must be ≤46 dB.

**AUTO MODE**
- Line Blanking Timing Measurements
- Field Blanking Timing Measurements
- Other Timing Measurements
- Amplitude And Phase Measurements
- Frequency Response Measurements
- Waveform Distortion Measurements
- Low Frequency Error
- Noise Measurements
- Incidental Carrier Phase Modulation

**POWER REQUIREMENTS**

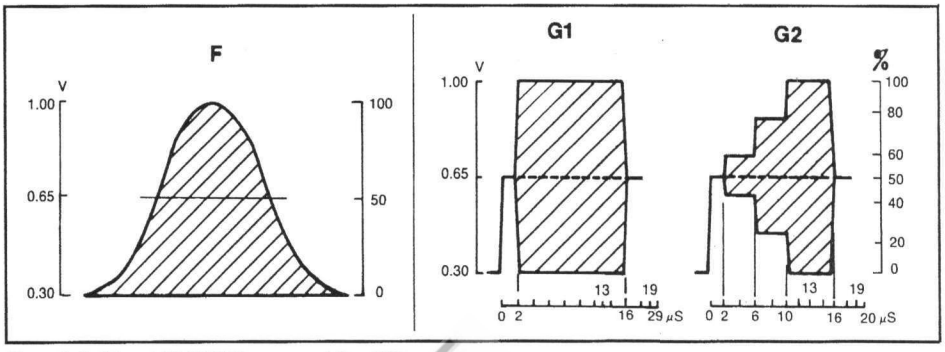
| | |
|---|---|
| Mains Voltage Range | 87 Vac to 132 Vac or 174 Vac to 250 Vac |
| Mains Frequency | 47 Hz to 63 Hz |
| Power Consumption | 250 Watts |

**ENVIRONMENTAL**

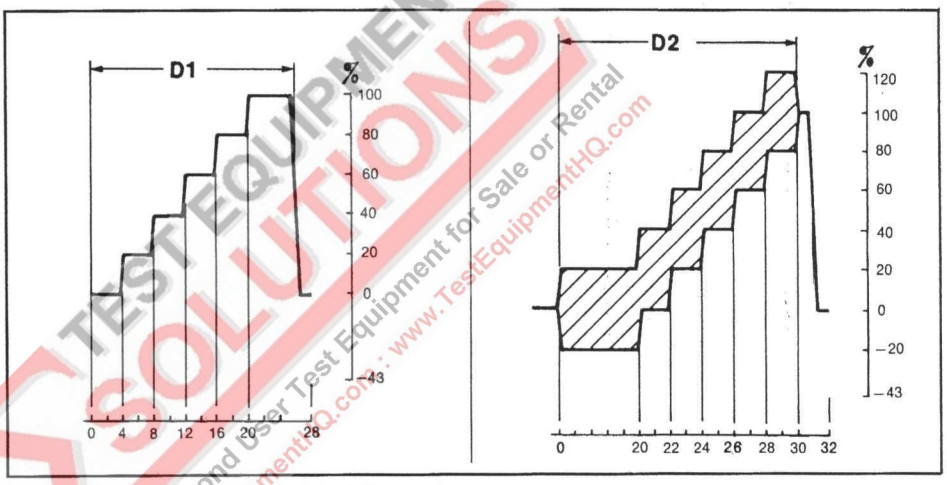
| | |
|---|---|
| Operating Temperature Range | 0°C to 50°C ambient |

**PHYSICAL CHARACTERISTICS**

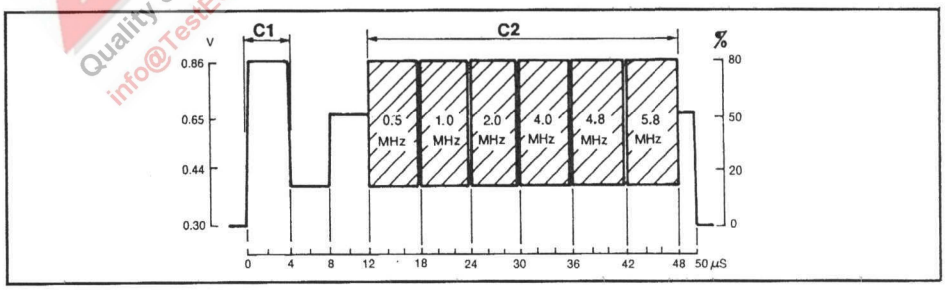
| Dimensions | mm | in |
|---|---|---|
| Width | 483 | 19.00 |
| Height | 222 | 8.75 |
| Depth | 556 | 21.90 |
| **Weight** | **kg** | **lb** |
| Approximately | ≈20 | ≈45 |




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




Elements D1 and D2 (CCIR Recommendation 569).




Elements C1 and C2 (CCIR Recommendation 569).

## ORDERING INFORMATION

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

### INCLUDED ACCESSORIES

Instruction manual; 75 Ω terminators (3) 011-0102-00; power cord.

### OPTIONS

**Option 11** — PAL Measurements
**Option 01/11** — Dual Standard Measurements
**Option 20** — Teletext Measurements
**Option 21** — Camera Measurements
**Option 30** — Component Measurements
**Option 40** — Audio Measurement Module
**Option 41** — 6 Channel Audio Measurement Module
**Option 42** — Audio to Video Delay Measurement
**Option 48** — GPIB Interface

### OPTIONS (CONTINUED)

**Option 1C** — Cabinet Version
**Option 1G** — Echo/Rounding Measurements
**Option 1P** — Printer
**Option 1T** — Calibration – NIST/MIL Traceable
**Option 1Z** — Probe Adapter (067-1429-00)
**Option 3Z** — Probe Adaptor (3 each of 067-1429-00)
**Option M2** — Remedial Service Support
**Option M8** — Calibration Service

### VM 700A SOFTWARE UTILITIES

**VMBKP** — VM 700A Backup Utility
**VMREMGR** — Remote Graphics Software for the VM 700A
**VMT** — VM 700A Remote Control Software

### OPTIONAL ACCESSORIES

**VM7FC1** — Field installable conversion kit to convert rack mount unit to cabinet.
**VM7FR1** — Field installable conversion kit to convert cabinet to rack mount unit.