NTSC Video Measurement Set

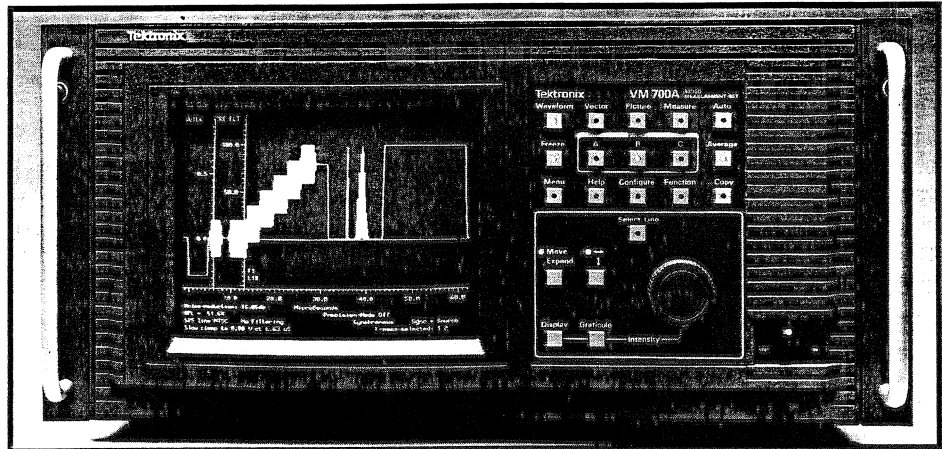## VM 700A Option 01

◤◣ Features

- Digital Waveform Monitor
- Digital Vectorscope
- Group Delay and Frequency Response
- Noise Measurement Set
- Automatic Measurement Set

AUTO MODE
- Unattended Monitoring of NTSC 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
- Chrominance to Luminance Delay
- Noise Spectrum
- Group Delay With (Sin x)/x
- Color Bars
- Chrominance AM/PM Noise
- 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

VM 700A Option 01 NTSC Video Measurement Set.

The VM 700A 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 VM 700A Auto Mode makes standard video measurements automatically, including those specified in RS-250B/EIA-250C, NTC-7, and RS-170A. 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 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 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.

VITS ID provides a quick reference of vertical interval test signal locations.
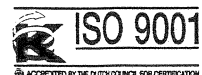
PICTURE MODE
The signal source can be quickly verified using the picture display. Any line may be selected on the picture for viewing in the waveform or vector displays.

NTSC Video Measurement Set
VM 700A Option 01

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 VM 700A 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.
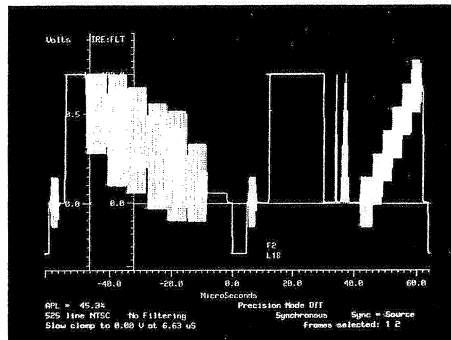
REMOTE OPERATION

The VM 700A 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 VM 700As. 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.
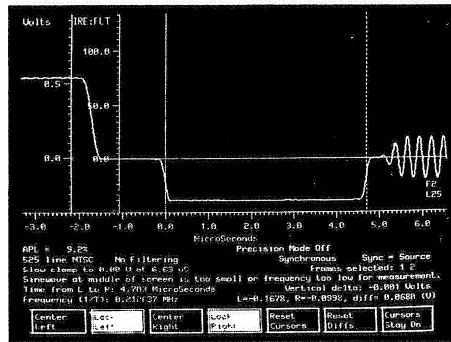
Specifications

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.
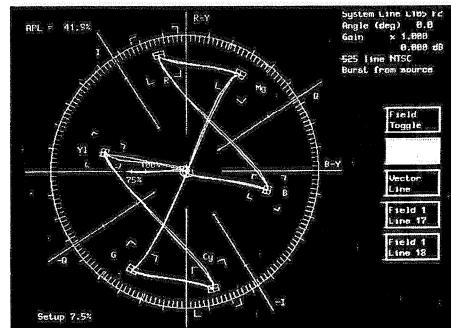
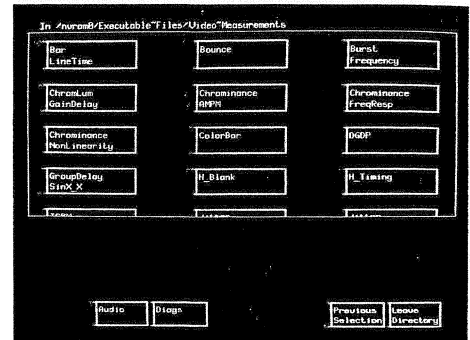The range specifies the extremes between which a measurement can be made.

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.

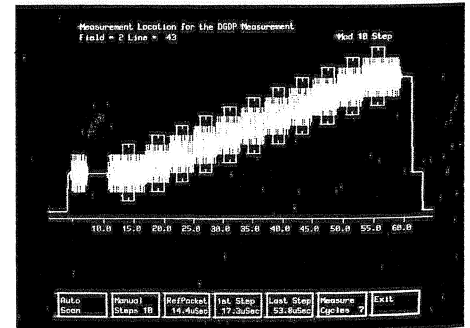*Picture Mode display. (Video courtesy of KOIN-TV, Portland, Oregon.)*

In Vector Mode, the VM 700A 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.

NTSC Video Measurement Set
VM 700A Option 01

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 – AUTO MODE

The following paragraphs describe the measurement methods for each measurement. Each timing measurement method is written for the FCC method. If there is an RS-170A method for that same measurement, and the RS-170A method differs from the FCC method, the RS-170A requirement is enclosed within square brackets in the FCC description.

HORIZONTAL INTERVAL TIMING MEASUREMENTS

These timing measurements are made within the active picture area, averaging the results over 32 lines starting at line 50 and skipping 1 frame plus 5 lines for each successive sample (i.e., average over line 50 of first field, line 56 of second field, line 62 of the third field, etc.).

Breezeway Width – Measured from the 10% point on the trailing edge of horizontal sync (nominally –4 IRE) to the leading half-amplitude point of the burst envelope.

Color Burst Width – Measured from the leading half-amplitude point on the burst envelope [leading zero crossing of the first half-cycle of burst that exceeds 50% of burst amplitude] to the trailing half-amplitude point on the burst envelope [trailing zero crossing of the last half-cycle of burst that exceeds 50% of burst amplitude].

Front Porch Duration – Measured from the 10% point on the trailing edge of setup (+4 IRE nominally) to the 10% [50%] point on the leading edge of sync (nominally –4 [–20] IRE).

Horizontal Blanking Width – Measured between the points on the leading and trailing edges of horizontal blanking that are at an amplitude of 10% [50%] of sync above blanking level (nominally 4 [20] IRE).

Horizontal Sync Rise Time and Fall Time – Measured between the 10% and 90% points on the leading and trailing edges of horizontal sync, respectively (nominally 4 IRE and 36 IRE).

Horizontal Sync Width – Measured between the 10% [50%] points on the leading and trailing edges of horizontal sync (nominally 4 [20] IRE).

```
Channel A      Source   System Default      Tue Oct 20 12:50:28 1992

                              VM700A Video Measurement Set
System Default                              Violated Limits
                                             Lower  Upper
Avg. Picture Level      39.1  %                               At Meas. Cycle Start
Bar Top                  7.9  % Carr   **    10.0   15.0
Blanking Level          73.8  % Carr    *    74.0   76.0
Bar Amplitude          101.3  IRE
Sync Amplitude          40.1  % Bar
Blanking Variation       0.5  % Carr
Blanking Variation       0.8  % Bar
Sync Variation           0.6  % Carr
Sync Variation           0.9  % Bar
Burst Amplitude        101.8  % Sync
Burst Amplitude         40.8  % Bar

FCC H Blanking          10.85 us
FCC Sync Width           4.84 us
FCC Sync-Setup           9.42 us
FCC Front Porch          1.42 us
Sync to Burst End        7.87 us          *     5.00   7.80
Breezeway Width          0.56 us
FCC Burst Width          8.8  Cycles
Sync Risetime          142   ns
Sync Falltime          142   ns
RS-170A H Blanking      11.30 us         **    10.65  11.15
RS-170A Sync Width       4.70 us
RS-170A Sync-Setup       9.35 us
RS-170A Front Porch      1.49 us
Sync to Burst Start      5.31 us
RS-170A Burst Width      9.0  Cycles

V Blank 4 IRE F1        20.0  Lines
V Blank 4 IRE F2        20.1  Lines
V Blank 20 IRE F1       20.0  Lines       *    20.1   20.9
V Blank 20 IRE F2       20.6  Lines
FCC Equalizer           51.0  % S.W.
FCC Serration            4.52 us
RS-170A Equalizer        2.33 us
RS-170A Serration        4.66 us

VIRS Setup               6.4  % Bar
VIRS Luminance Ref      46.2  % Bar       *    47.5   52.5
VIRS Chroma Ampl        65.1  % Burst    **    90.0  110.0
VIRS Chroma Ampl        26.6  % Bar      **    36.0   44.0
VIRS Chroma Phase        7.8  Deg         *    -5.0    5.0

Line Time Distortion     0.1  %
Pulse/Bar Ratio         99.2  %
2T Pulse K-Factor        0.2  % Kf
IEEE-511 ST Dist         0.6  % SD                            Ringing

S/N NTC7 Unweighted     58.4  dB                             RMS
S/N NTC7 Lum-Wghtd      64.5  dB                             RMS
S/N Unif Unweighted     58.2  dB                             RMS
S/N Unif Lum-Wghtd      65.1  dB                             RMS
S/N Periodic            57.8  dB                             RMS

S/N.2 NTC7 Unwghtd      57.2  dB                             RMS
```

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.

SCH Phase – Phase at the middle of burst relative to the 50% point on the sync leading edge.

Sync to Setup – Measured from the 10% [50%] point on the leading edge of sync (nominally 4 [20] IRE) to the point on the trailing edge of blanking that is equivalent to 10% of sync (nominally 4 IRE).

Sync-to-Start-of-Burst – Measured from the 50% point on the leading edge of sync (nominally 20 IRE) to the leading zero crossing of the first half-cycle of burst that exceeds 50% of burst amplitude.

Sync-to-End-of-Burst – Measured from the 10% point on the leading edge of horizontal sync (nominally 4 IRE) to the half-amplitude point on the trailing edge of the burst envelope.

NTSC Video Measurement Set

VM 700A Option 01

VERTICAL INTERVAL TIMING

Equalizing Pulse Width – Measured between the 10% [50%] points on the equalizing pulse (nominally 4 [20] IRE).

Serration Width – Measured between the 10% [50%] points of serration (nominally 4 [20] IRE).

Vertical Blanking Width – Measured between the points on setup [active picture] at a level equal to 10% [50%] of sync amplitude (nominally 4 [20] IRE), where setup [active picture] immediately precedes and follows the vertical blanking interval.

COLOR BAR MEASUREMENTS

Color Bar Amplitude Error – Measured as deviation of the peak-to-peak amplitude of each color bar from the nominal value for that color bar expressed as a percent of the nominal value. Six values reported.

Color Bar Phase Error – Measured as deviation of the phase of each color bar from the nominal phase for that color bar, relative to burst phase. Six values reported.

Color Bar Chrominance-Luminance Gain Ratio – Measured as ratio of chrominance level to luminance level of each color bar, relative to the nominal ratio for each color bar. Six values reported.

Color	Amplitude	Phase	C/L Gain Ration
Yellow	67.36%	167.59 deg	1.0092
Cyan	94.74%	283.54 deg	1.8045
Green	89.04%	240.67 deg	2.0123
Magenta	89.04%	60.67 deg	2.8957
Red	94.74%	103.54 deg	4.2106
Blue	67.36%	347.59 deg	8.1652

FCC Color Bars Nominal Values
(Source: FCC Rule 73.699, Figure 14).

```
S/N.2 NTC7 Lum-Wghtd    60.7   dB                              RMS
S/N.2 Unif Unwghtd      57.0   dB                              RMS
S/N.2 Unif Lum-Wghtd    61.0   dB                              RMS

Chroma-Lum Delay         1.8   ns
Chroma-Lum Gain        101.8   %
                                                       At   28% APL
Differential Gain        0.61  %                       At   28% APL
Differential Phase       0.31  Deg                     At   46% APL
Lum Non-Linearity        0.66  %                       At   28% APL
Relative Burst Gain     -0.05  %                       At   28% APL
Relative Burst Phase     0.02  Deg

NTC7 Multiburst Flag     8.0   % Carr   **    10.0    15.0
NTC7 Multiburst Flag   100.0   % Bar
NTC7 MB Packet #1       49.8   % Flag
NTC7 MB Packet #2       49.6   % Flag
NTC7 MB Packet #3       49.8   % Flag
NTC7 MB Packet #4       50.2   % Flag
NTC7 MB Packet #5       50.3   % Flag
NTC7 MB Packet #6       50.8   % Flag

NTC7 20 IRE Chroma      19.9   IRE                     (Ref 40 IRE Chr)
NTC7 80 IRE Chroma      80.1   IRE                     (Ref 40 IRE Chr)
NTC7 Chr NL Phase        0.2   Deg
NTC7 Chr-Lum Intmd      -0.0   IRE                     (Ref Lum Pedestal)

ICPM                     0.0   Deg

SCH Phase               -1.8   Deg

Field Time Dist       ------- % Bar    **    -3.00    3.00 Not Found

FCC Color Bars
             Amplitude Error      Phase Error      Chr/Lum Ratio Error
                ( % )              ( Deg )              ( % )
   Yellow       0.8                -0.3                 0.7
   Cyan         1.3                -0.1                 1.1
   Green        1.3                -0.1                 1.2
   Magenta      1.1                -0.1                 1.0
   Red          1.2                 0.1                 1.0
   Blue         1.8                -0.0                 1.2
```

Measurement results.

NTSC Video Measurement Set
VM 700A Option 01

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
- RS-170A Horizontal Blanking Interval Timing Measurements
- RS-170A Vertical Blanking Interval
- FCC Horizontal Blanking Interval Timing Measurements
- FCC Vertical Blanking Interval Timing Measurements
- Amplitude and Phase Measurements
- Frequency Response Measurements
- Incidental Carrier Phase Modulation
- Color Bar Measurements
- Out-of-Service Measurements
- Waveform Distortion Measurements
- VIRS Measurements
- Signal-to-Noise Ratio Measurements

POWER REQUIREMENTS
Mains Voltage Range – 87 V AC to 132 V AC or 174 V AC to 250 V AC.

Mains Frequency – 47 Hz to 63 Hz.

Power Consumption – 250 Watts.

ENVIRONMENTAL
Operating Temperature Range – 0°C to 50°C ambient.

CERTIFICATIONS
EMC – Certified to the EMC Directive 89/336/EEC.
Safety – Approved to: UL1244, CAN/CSA-C22.2 No.231.
Complies with: HD401 S1, IEC 348.

PHYSICAL CHARACTERISTICS

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

PAL Video Measurement Set

VM 700A Option 11

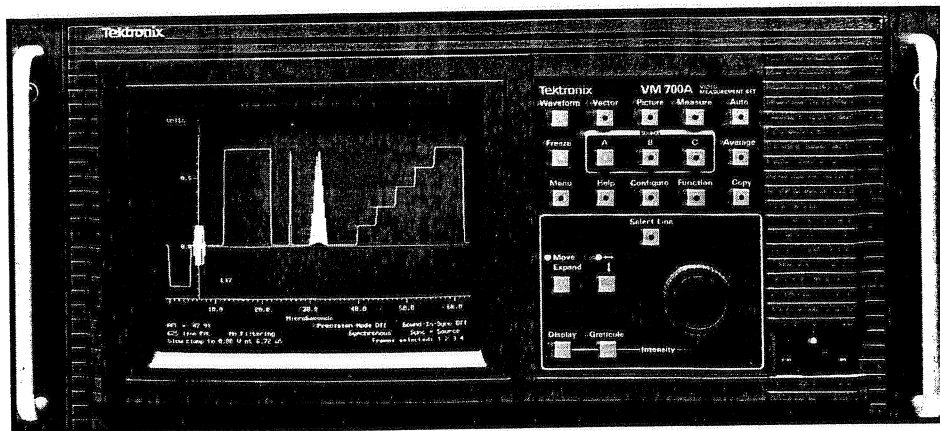VM 700A Option 11 PAL Video Measurement Set.

▟◣ Features

- 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 VM 700A 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 VM 700A 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 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 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.

PAL Video Measurement Set
VM 700A Option 11

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 VM 700A 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 VM 700A 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 VM 700As. 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.
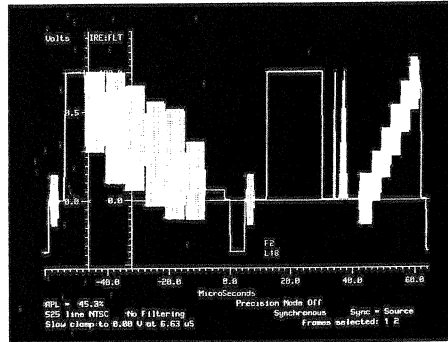
Vertical interval test signals can be seen very clearly for additional analysis of the signal. These can be printed as support documentation for automatic measurement results.
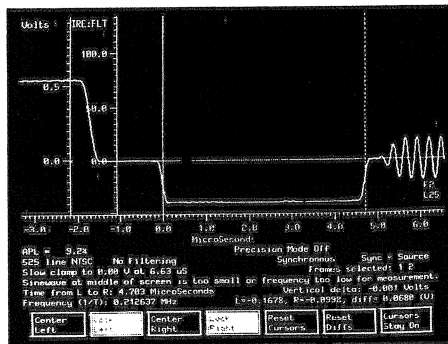

Even a single horizontal synchronization pulse can be displayed at a high intensity.
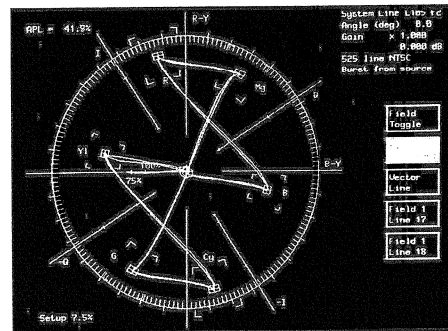
In Vector Mode, the VM 700A becomes a digital vectorscope with an electronic graticule. A "Color Bar Search" feature makes it easy to quickly display a line containing a color bar test signal.
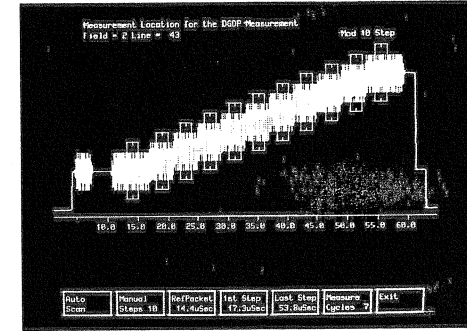
MEASUREMENT METHODS

The following paragraphs specify the methods for each Option 11 measurement. Where appropriate, reference is made to the relevant CCIR recommendation.
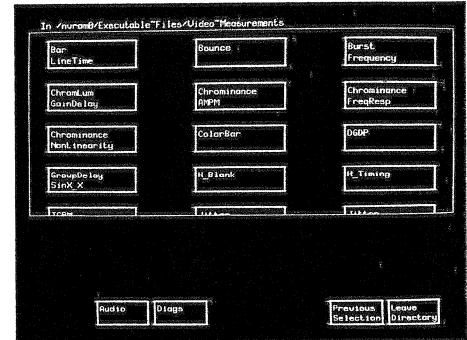
Main Measure Mode display of available measurements.
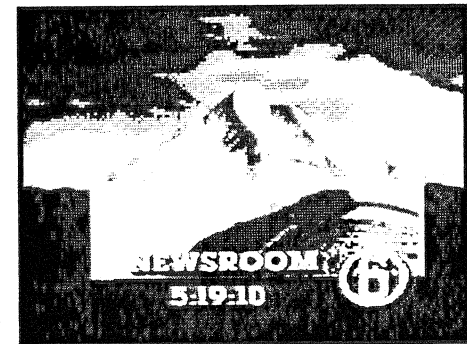
Picture Mode display. (Video courtesy of KOIN-TV, Portland, Oregon.)

Measure Mode DGDP special position acquisition feature.

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.

PAL Video Measurement Set

VM 700A Option 11

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).

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.

```
                      VM700A Video Measurement Set

         Channel A  System Default                06-Jan-93   11:06:26
                              VM700A Video Measurement Set
         System Default                               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  %                              At  54% APL
         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

         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.

PAL Video Measurement Set
VM 700A Option 11

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.
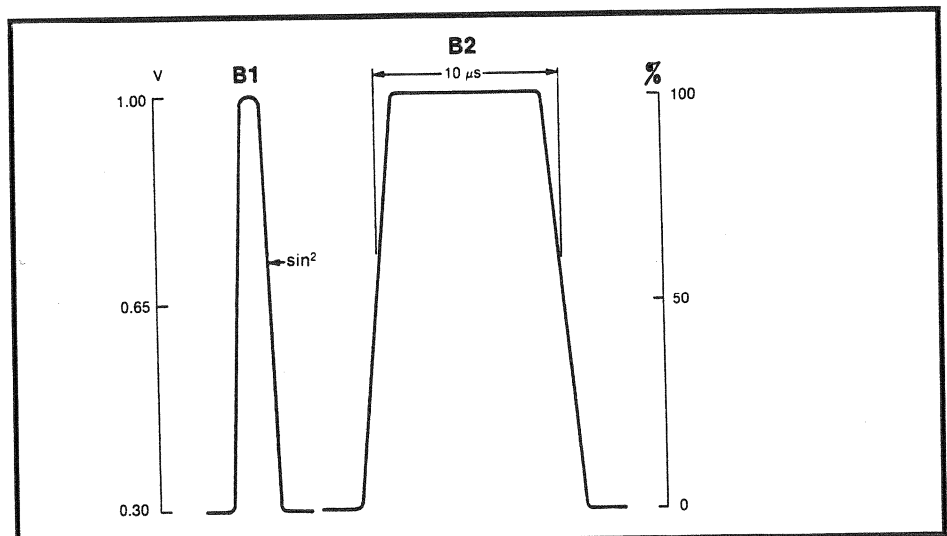
C/L Gain Inequality – Measured as the difference between the sampled peak-to-peak amplitude of the 700 mV (nominal) chrominance packet (G1 or G2) and the sampled amplitude of the luminance bar (also nominally 700 mV). Result expressed as a % of sampled bar amplitude. Sign is positive if the chrominance amplitude is greater than the luminance amplitude. See element G1 or G2 and CCIR Recommendation 569.
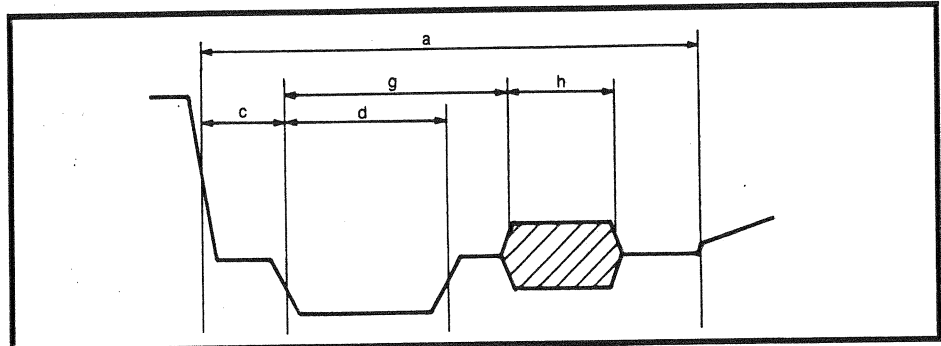
Line Blanking Timing waveform measurements.
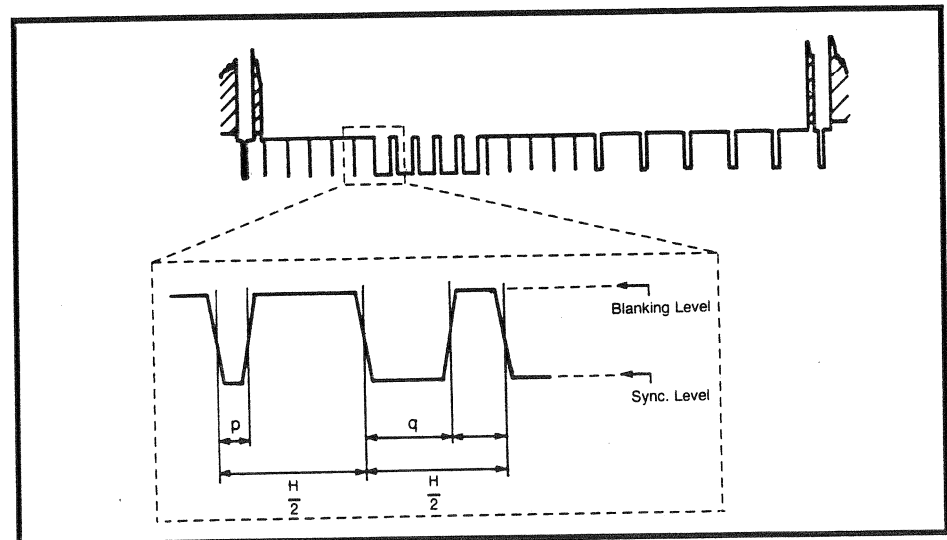
Line Blanking Timing waveform measurements.

Field Blanking Timing waveform measurements.

PAL Video Measurement Set
VM 700A Option 11

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 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.
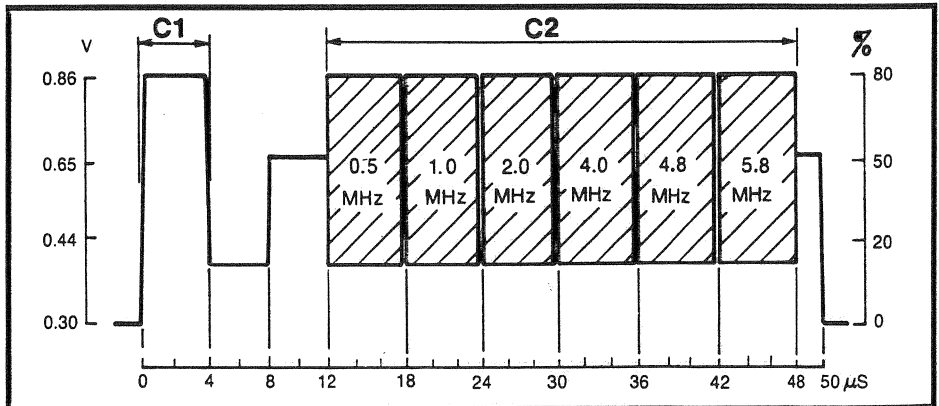
FREQUENCY RESPONSE MEASUREMENTS
Multiburst Flag Amplitude – Measured from the center point of the flag top to the ensuing bottom of the flag. Result expressed as % of sampled bar amplitude. See element C1 and CCIR Recommendation 567.
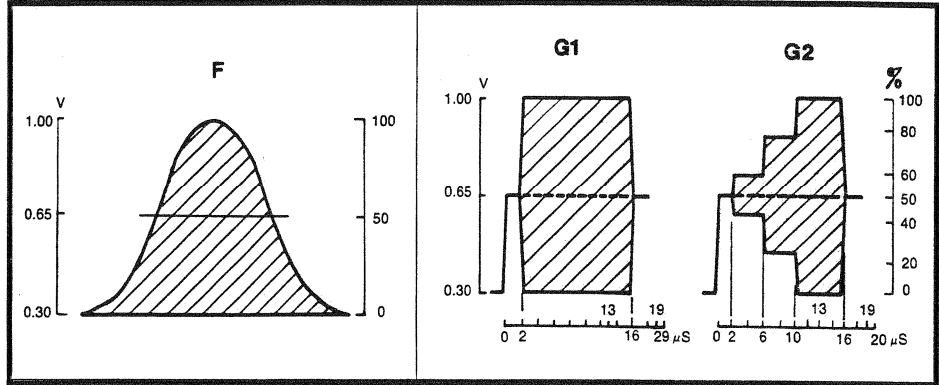
Elements F, G1, and G2 (CCIR Recommendation 567).
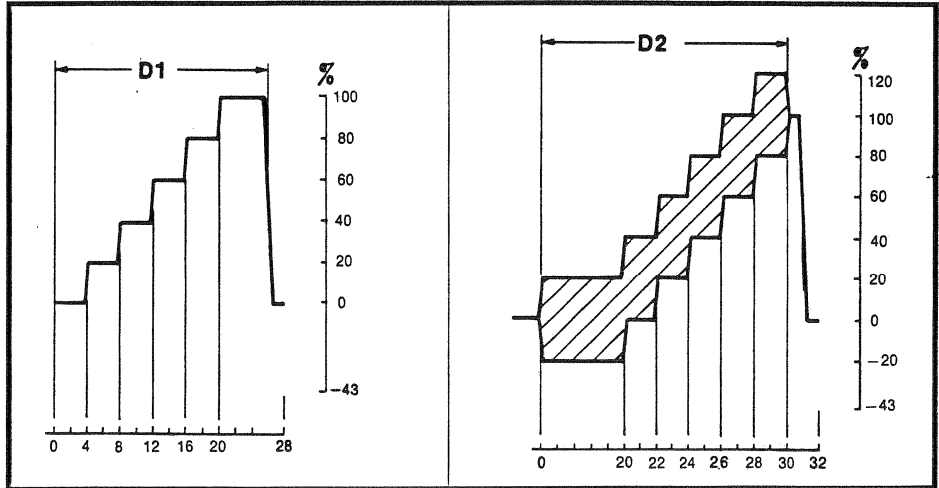
Elements D1 and D2 (CCIR Recommendation 569).

Elements C1 and C2 (CCIR Recommendation 569).

PAL Video Measurement Set
VM 700A Option 11

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.

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.

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 V AC to 132 V AC or 174 V AC to 250 V AC.
Mains Frequency – 47 Hz to 63 Hz.
Power Consumption – 250 W.

ENVIRONMENTAL
Operating Temperature Range – 0°C to 50°C ambient.

CERTIFICATIONS
EMC – Certified to the EMC Directive 89/336/EEC.
Safety – Approved to: UL1244, CAN/CSA-C22.2 No.231.
Complies with: HD401 S1, IEC 348.

PHYSICAL CHARACTERISTICS

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

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

VM 700A
Measurement Set.
Includes: Instruction Manual; 75 Ω Terminators (3) 011-0102-00; Power Cord.
Opt. 11 – PAL 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. 1P – Printer.
Opt. 1T – Calibration – NIST/MIL Traceable.
Opt. 1Z – Probe Adapter (067-1429-00).
Opt. 3Z – Probe Adaptor (3 each of 067-1429-00).
Opt. M2 – Remedial Service Support.
Opt. M8 – Calibration Service.

VM 700A SOFTWARE UTILITIES
VMBKUP – 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.

Teletext Measurements
VM 700A Option 20

## ◢◣ Features

PROVIDES NUMERICAL RESULTS FOR:
- Eye Height
- Eye Width
- Data Levels (Logical "0" and Logical "1" Levels)
- Start of Data Code
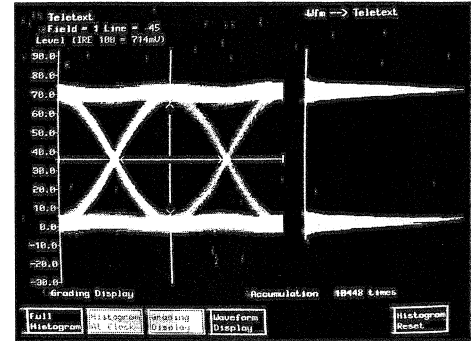- Number of Run-in Bits

PROVIDES GRAPHICAL DISPLAYS FOR:
- Eye Height with Variable Persistence
- Eye Height with Grading
- Amplitude Histogram
- Teletext Timing

MULTIPLE CLOCK FREQUENCIES
- 5.727272 MHz for System M (NTSC)
- 6.9375 MHz for System B/G/I (PAL)
- Cursors for Manual Measurements
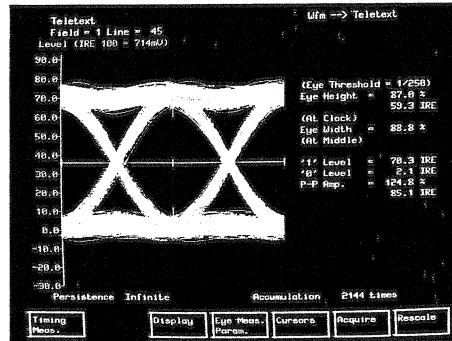
Teletext Eye Height and Eye Width display.

Teletext Eye Height and Eye Width display with histogram.

The VM 700A Option 20 provides the capability to measure and monitor teletext signals for either NTSC or PAL systems. Option 20 adds the Teletext measurement to the Measure mode of the VM 700A. The measurement can be made on teletext signals with clocks of 5.727272 MHz for System M (NTSC) or 6.9375 MHz for System B/G/I (PAL). Other clock frequencies may be available in the future.

The measurement displays the teletext eye height pattern along with numbers for both eye height and eye width. A soft key selection can add a histogram display of all amplitudes or the amplitudes at any point at the clock. This is a useful statistical tool for seeing noise and jitter in the teletext signal. A grading display of eye height is also provided at the touch of a soft key. This provides visual feed-back on density levels for "ones" and "zeros". A timing display of the teletext signal provides data timing from leading edge of sync to last run-in bit and run-in bit width. Also at the touch of a soft key are horizontal or vertical cursors which are useful for manual measurements.

All of these parameters can be reported in a numerical format over the RS-232C interface or sent to a printer. In addition, the measurements can be tested against upper and lower user defined limits.

ORDERING INFORMATION

For pricing information contact your local Tektronix representative.

To order a new VM 700A with teletext measurement capability, order VM 700A Opt. 01 and/or Opt. 11 and Opt. 20.

If you own a VM 700A and wish to add teletext measurement capability, order VM7F02 Opt. 01 and/or Opt. 11 and Opt. 20.

If you own a VM 700 and wish to add teletext measurement capability, order VM7F02 Opt. 01 and/or Opt. 11, Opt. 45 and Opt. 20.
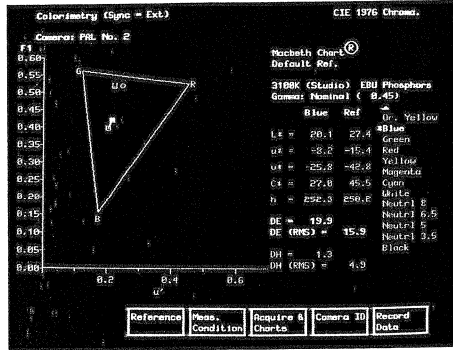
# Camera Measurements

VM 700A Option 21

Features

- Significantly Simplifies Key Measurements of Camera Performance
- Compatible with NTSC or PAL Cameras
- Automates Pre-purchase Evaluation and Comparison of Cameras
- Reduces Time Spent on Acceptance Testing, Routine Maintenance and Operational Adjustments
- Uses Industry Standard Charts
- Camera Matching Simplified with Relative-to-reference Mode
- Four Key Measurements:
  - Colorimetry
  - CCD Defects
  - Fixed Pattern Noise
  - Frequency Response
- Five Additional Measurements:
  - Detail
  - Gamma
  - Geometry and Registration
  - Shading
  - Vertical Smear

Colorimetry.

The Tektronix VM 700A Option 21 Camera Measurements package simplifies several key camera measurements for both tube and CCD television cameras. By automating measurement and characterization routines, the time consuming tasks of evaluating and comparing cameras become quick, objective and repeatable. Whether for pre-purchase evaluation, acceptance testing, routine maintenance or operational adjustments, Option 21 saves valuable time while providing the time-proven reliable digital measurements of the VM 700A.
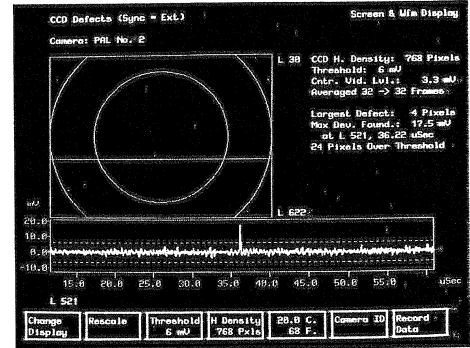
CCD Defects measurement with single-line waveform display.

Note that DSC*[1] is the recommended supplier for all test charts and test chart illumination sources for use with Option 21.

*[1] DSC Laboratories, 3565 Nashua Dr., Mississauga, Ontario L4V 1R1.

ORDERING INFORMATION

For pricing information contact your local Tektronix representative.

To order a new VM 700A with camera measurement capability, order VM 700A Opt. 01 and/or Opt. 11 and Opt. 21.

If you own a VM 700A and wish to add camera measurement capability, order VM7F02 Opt. 01 and/or Opt. 11 and Opt. 21.

If you own a VM 700 and wish to add camera measurement capability, order VM7F02 Opt. 01 and/or Opt. 11, Opt. 45 and Opt. 21.

Component Measurements
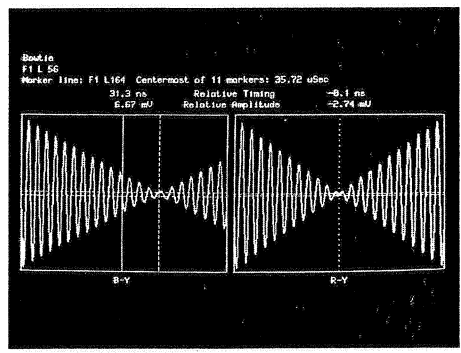## VM 700A Option 30

Features

PROVIDES NUMERICAL RESULTS FOR:
- Relative Timing of B-Y and R-Y
- Relative Amplitude of B-Y and R-Y
- Peak to Peak Amplitude for B-Y and R-Y
- Peak White Amplitude

COMPONENT MEASUREMENTS:
- Bowtie
- Lightning
- Component Color Bars
- Component K Factor
- Component Multiburst
- Component Non-linearity
- Overlay
- Parade
- Component Vector
- Component Noise
- Compatible with SMPTE/EBU, Betacam®*1, and MII Formats

*1 Betacam is a registered trademark of Sony Corporation.

Bowtie display.
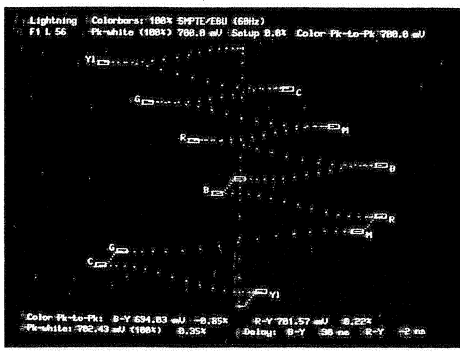
Lightning display.

The VM 700A Option 30 provides the capability to measure some important component analog video parameters for either 525/60 or 625/50 systems.

ORDERING INFORMATION

For pricing information contact your local Tektronix representative.

To order a new VM 700A with component measurement capability, order VM 700A Opt. 01 and/or Opt. 11 and Opt. 30.

If you own a VM 700A and wish to add component measurement capability, order VM7F02 Opt. 01 and/or Opt. 11 and Opt. 30.
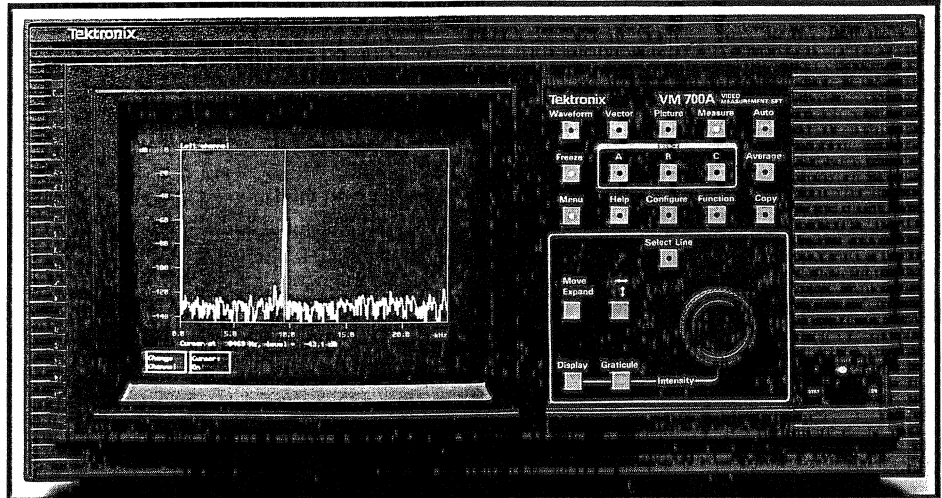
If you own a VM 700 and wish to add component measurement capability, order VM7F02 Opt. 01 and/or Opt. 11, Opt. 45 and Opt. 30.
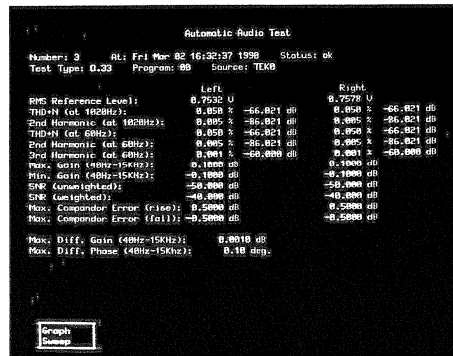
Audio Measurements

VM 700A Options 40/41

Real-time FFT provides spectral display of audio frequencies.

Features

- Automatic Measurement of Short Duration Audio Test Sequence
- Combined Video and Audio Performance Reports
- Real-time Spectral Display
- Real-time Multitone Analyzer
- Single Stereo Audio Input on Option 40
- Three Stereo Audio Inputs on Option 41
- Measure Frequency Response, Distortion, Phase, Crosstalk, and Other Important Audio Parameters

Automated audio measurement results.
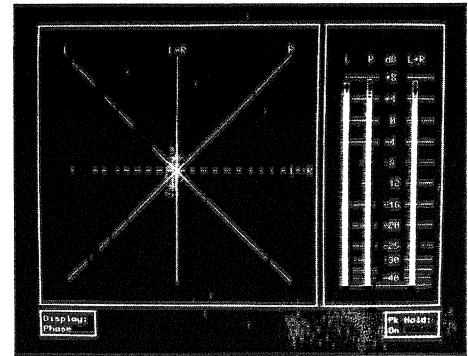
Audio monitor application with X-Y display and level meters.

The VM 700A Option 40 Audio Measurement Set expands the power of the VM 700A Option 01 NTSC or Option 11 PAL Video Measurement Set to include comprehensive audio measurement capabilities. This option incorporates both automated and manual audio measurements, audio spectral analysis, multitone analysis, and stereo audio monitoring into the VM 700A's full set of video measurements. There are a total of four multitone signals available.

With this module, the VM 700A can continuously monitor your audio lines for the presence of a test sequence designed for automated testing. The sequence of test tones begins with a one second FSK signal which identifies the source of the test signals, indicates which stored measurement program is to be used, and instructs the VM 700A to begin measurements. The remainder of the sequence consists of a number of test tones at defined levels and frequencies, each tone typically being one second in duration. This sequence is inserted in the audio line by the Tektronix ASG 100 or other device capable of creating a compatible sequence.

Testing to the ANSI standard T1.502-1988, EIA/TIA-250-C or CCITT 0.33 is accomplished through stored measurement programs. The CCITT 0.33 recommendation specifies test tone sequence parameters necessary for rapidly measuring stereophonic pairs and monaural sound program circuits, links, and connections. FSK tones unique to each sequence type prompt the Option 40 Audio Measurement Set to perform the appropriate measurement.

Audio measurement results obtained via automatic monitoring can be included in the VM 700A's Auto mode video measurements display with the time and date of the last sequence received. Timed reports and logging of results outside user defined limits can be done automatically. Additionally, a file in the VM 700A's Measurement Results directory is updated each time a sequence is received and measured.

Audio Measurement Sets

VM 700A Options 40/41

In addition to automated measurements, this option provides real-time displays of audio parameters. A dual-channel audio spectral display of frequencies from 10 Hz to 20kHz is derived from a real-time FFT. A cursor allows direct signal level measurements at desired frequencies. A high resolution mode allows more detailed analysis of any 3 kHz section of the spectrum. The "View Harmonics" mode can be used to look for harmonics of the power line frequency or any user defined frequency. This is very useful for tracing hum problems.

The multitone analyzer mode measures a test signal consisting of sinewaves at several frequencies generated simultaneously. The phases of these frequencies are chosen such that the overall crest factor is minimized. The measurement is only compatible with multitone signals from ASG 100. The VM 700A automatically recognizes which of these four signals it is receiving. From the received multitone signal, this mode produces real-time displays of frequency response, crosstalk, phase, and distortion plus noise. This is useful when only a few seconds are available to perform a complete measurement, or for adjusting a processing device, or nulling out a distortion.

A software implementation of the Tektronix 760 Stereo Audio monitor is also built into the Option 40 Audio Measurement Set. This display offers valuable information in both monitoring and setup roles through its graphic portrayal of the stereo audio signal. Bar graphs of the left and right channels accompany the stereo audio display. These graphs can utilize the Nordic, DIN or PPM scales available for the 760, or a VU scale.

The audio analyzer mode displays in real-time the frequency, level and THDN for each channel. The level and phase difference between channels are also displayed. Additionally, this mode can display a graph of level versus frequency, THD+N versus frequency, crosstalk and phase in response to an incoming sweep.

VM 700A OPTION 41 (TRIPLE-INPUT AUDIO)

Option 41 adds three stereo audio inputs to the VM 700A. This provides the capability to measure the audio signals from three stereo audio sources via separate inputs. Option 41 operates like Audio Option 40, but with minor differences, including:

CONFIGURATION OF THE SOURCE SELECTION AUDIO FILE

Unlike Option 40, Option 41 allows specification of an individual audio channel (1,2,3) to a video source (A, B, or C). Selection of the three audio channels then follows selection of the video source from the VM 700A keypad.

REAR PANEL CONNECTOR TYPE AND PIN ASSIGNMENTS

The VM 700A with Option 41 utilizes a male DB-37 connector located on the instrument back panel for signal input as opposed to the mini-XLRs used by Option 40. This allows input of up to 3 balanced line stereo pairs.

OPERATION

Operation of Option 41 is similar to Option 40. Multitone, Audio Analyzer, Audio Spectrum Analyzer, Audio Monitor and View Audio Auto Test all work the same under Option 41. The only difference is that the audio channel to be measured is specified in the Source Selection Audio File.

Because the audio source selection is internal to the VM 700A, Option 41 is ideal for measuring outputs from devices with more than one audio pair out, such as production VCRs and audio distribution amplifiers.

Characteristics

AMPLITUDE MEASUREMENTS

Range (for specified accuracy) – –69 dBu to +26.5 dBu (275 µV to 16.4 VRMS).

Resolution – ±0.1 dB.

Accuracy – 20 Hz to 20 kHz.

Including Flatness –
±0.2 dB (input ≥–20 dBu).
±0.3 dB (–50 dBu to –20 dBu).
±0.5 dB (–60 dBu to –50 dBu).
±1.0 dB (–70 dBu to –60 dBu).

Flatness – ±0.1 dB from 20 Hz to 20 kHz.

Frequency Measurements –
Range: 10 Hz to 20 kHz.
Resolution: 1 Hz. Accuracy: 1 Hz.

Distortion Measurements –
Range: ≤0.01% to 33%.
Residual THD+N: ≤0.01% (≤–80 dB) measured over a 20 kHz bandwidth, for inputs from 10 Hz to 10 kHz above –13.5 dBu.

MULTITONE ANALYZER

Level of Multitone Relative to RMS Level –
Multitone 1: –19.9 dB.
Multitone 2: –18.9 dB.
Multitone 3: –13.8 dB.
Multitone 4: –15.9 dB.

Reference Frequency for Multitone Recognition – Multitone 1: 422 Hz.
Multitone 2: 562 Hz.
Multitone 3: 656 Hz.
Multitone 4: 750 Hz.

Minimum Multitone Recognition Time –
1 second.

Measurement Update Rate – 5 readings per second.

Maximum Frequency Error for Multitone Recognition – Within ±10% of reference frequency.

Level and Frequency Measurement Accuracy – Same as audio analyzer.

OTHER

Input Connectors – Option 40: Two miniature XLR (Switchcraft TY3F).
Option 41: One male DB-37.

Input Impedance – 50 Ω (differential).

Signal-to-Noise (in Auto Range) – For inputs ≥–18 dBu (100 mV) s/n ≥82 dB[1].
For inputs ≥0 dBu (775 mV) s/n ≥98 dB[1].
For inputs ≥+8 dBu (2 V) s/n ≥106 dB[1].
"A" weighting improves s/n by ≈ 2.5 dB.

Level Difference Between Channels –
≤0.5 dB.

Phase Difference Between Channels –
≤2 degrees.

Phase Measurement Error – ≤2 degrees.

Channel Separation – >70 dB to 60 Hz (due to DC offset effects); ≥95 dB from 60 Hz to 20 kHz.
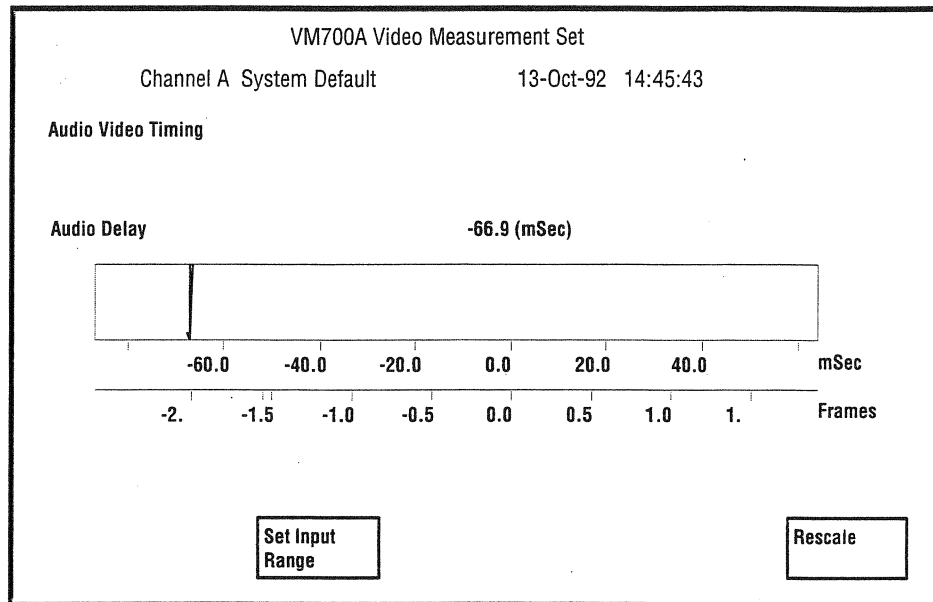

A/V Delay Measurement Packages

VM 700A Option 42 • AVTIME

Features

- Measures Audio to Video Delay of Your Transmission Paths
- Operates in Both NTSC and PAL Video Standards
- Detects Audio to Video Delay of up to 120 Video Frames
- Can Detect Audio to Video Delay on All Three VM 700A Video Inputs
- Audio Input Range Selectivity from +30 dBu to −102 dBu
- Easy to Read Graphic Display

```
                    VM700A Video Measurement Set

        Channel A  System Default              13-Oct-92  14:45:43

    Audio Video Timing


    Audio Delay                              -66.9 (mSec)




            -60.0      -40.0     -20.0    0.0     20.0      40.0        mSec

         -2.      -1.5      -1.0     -0.5    0.0     0.5    1.0    1.   Frames



                    Set Input                              Rescale
                    Range
```

Option 42 Audio to Video Delay Measurement display.

VM 700A OPT. 42

The VM 700A Option 42 measures the timing difference between the audio and video portions of a program arriving from different transmission paths. This option supports both the NTSC and PAL video standards. This measurement is designed to be used in conjunction with a Tektronix VITS 200 NTSC VITS Inserter or VITS 201 PAL Insertion Generator and a Tektronix ASG 140 Audio Signal Generator or a specially modified ASG 100 Audio Signal Generator.

AVTIME

Complete Audio to Video Time Delay Measurement Package Including VM 700A with Option 40 Audio Measurement Hardware, Audio to Video Delay Measurement Option 42, a VITS 200 Series Inserter, and an ASG 140 Audio Signal Generator.

A/V Delay Measurement Packages

VM 700A Option 42 • AVTIME

The measurement requires both video and audio test signal connections to the VM 700A. All three video input channels may be used. The selected channel on the VM 700A is the source for the video measurement, but the required audio signal must be correctly switched externally when the VM 700A front panel channel selection is changed. The audio timing measurement is made on either the Left or the Right channel input; the measurement will look at both channels, and use the first arriving audio signal as the audio trigger.

To operate the audio to video delay measurement, the VITS inserter is connected to the audio generator with a special remote cable. A wiring diagram for construction of this special cable is included in the Option 42 supplemental manual insert. Once the VITS inserter is genlocked, it sends a control signal to the audio generator enabling an audio test tone. At the same instant, the VITS inserter outputs a special vertical interval video character ID.

Both audio and video signals are routed through your system and received by the VM 700A for measurement. The video and audio signals are simultaneously gated off and on, once every 5 seconds. The time delay between the received signals at the VM 700A is measured and displayed on an easy to read auto ranging graphic display.

ORDERING INFORMATION

For pricing information contact your local Tektronix representative.

VM 700A OPTION 42

Required Hardware for Option 42

The VM 700A Option 42 requires the VM 700A with the Audio Option 40, a VITS 200 NTSC VITS Inserter or VITS 201 PAL Insertion Generator, and an ASG 140 or ASG 1001 Audio Signal Generator*1.

To order the VM 700A Option 42 on a new VM 700A, order a VM 700A with Option 01 (NTSC) or 11 (PAL), (or both 01 and 11), Option 40 (audio measurement hardware), and Option 42.

If you own a VM 700A already with Audio Option 40 and wish to add Option 42, order a VM7F02 Option 42.

If you own a VM 700 and wish to upgrade to Option 42, you will need to return your VM 700 to the factory for upgrade to a VM 700A. Contact your local Tektronix representative for details.

*1 For ASG 100s below serial number B03XXXX, contact your local Tektronix representative for details on modifying your ASG 100 to support Option 42.

AVTIME

There is no required hardware for AVTIME as it is a complete system package that includes a VM 700A with Audio Option 40, the audio to video delay Option 42, a VITS 200 Series inserter/generator and an ASG 140 or ASG 100 Audio Signal Generator.

Opt. 01 – To order AVTIME for an NTSC television system, order "AVTIME Option 01." This includes a VM 700A with current NTSC video measurement firmware, Option 40 audio measurement hardware, Option 42 audio to video time delay application, a VITS 200 NTSC VITS Inserter and an ASG 140 Audio Signal Generator.

Opt. 02 – Same as above except includes an ASG 100 Audio Signal Generator in place of an ASG 140 Audio Signal Generator.

Opt. 11 – To order AVTIME for a PAL television system, order "AVTIME Option 11." This includes a VM 700A with current PAL video measurement firmware, Option 40 audio measurement hardware, Option 42 audio to video time delay application, a

VITS 201 PAL Insertion Generator and an ASG 140 Audio Signal Generator.

Opt. 12 – Same as above except includes an ASG 100 Audio Signal Generator in place of an ASG 140 Audio Signal Generator.

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

See Tektronix on the World Wide Web: http://www.tek.com

ISO 9001 Tektronix Measurement products are manufactured in ISO registered facilities.

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GPIB Interface

VM 700A Option 48

◢◣ Features

- Enhances VM 700A Remote Control Capability
- Allows Access to GPIB Environments and Development Software
- IEEE 488.2 Compatible
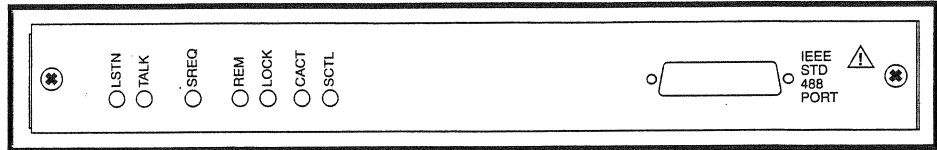
GPIB board rear panel.

The VM 700A Option 48 is an interface adaptor that extends the instrument's remote control capability to the GPIB (General-Purpose Interface Bus) environment. The interface streamlines system integration of the VM 700A in video equipment manufacturing environments.

The GPIB interface is easily selected through the Communications Setup file in the VM 700A Configuration mode. It supports all of the VM 700A commands and conforms to the IEEE 488.2 standard. The command set includes instrument identification and event/error handling.

With Option 48, the VM 700A can be linked to generators, analyzers, scopes, bed-of-nails testers, and other GPIB controlled devices (excluding GPIB printers) over a single bus.

ORDERING INFORMATION

For pricing information contact your local Tektronix representative.

VM 700A Opt. 48
VM 700A with Interface Adaptor installed.

VM7F02 Opt. 48
Field Upgrade (Interface Adaptor with Software and Installation Instructions).

RECOMMENDED ACCESSORIES
GPIB Interface Cables –
1 Meter Length Double-shielded Cable.
Order 012-0991-01.
2 Meter Length Double-shielded Cable.
Order 012-0991-00.
4 Meter Length Double-shielded Cable.
Order 012-0991-02.

VM 700A Software Utilities
VMT • VMBKUP • VMREMGR

◢◤ Features

VMT
- Control the VM 700 or VM 700A
- Pull Down and Pop Up Menus Simplify Operation
- Conditional Testing of Incoming Data
- PC Based Functions
- Text and Graphics Capture
- Adapts to VM 700A and Its Options

VMBKUP
- Three Programs Simplify Operation with a PC
- Programs Transfer User Created Files in Groups or Individually
- Provides Interactive Remote Control
- Uses Serial Line Internet Protocol (SLIP), an RS-232C Implementation of Transfer Control Protocol/Internet Protocol (TCP/IP)*1

VMREMGR
- Display VM 700A Graphics on a Remote PC
- Perform Front Panel Operations via Mouse
- Issue Remote Commands
- Terminal Operations

For your local Tektronix representative see the list in the back of this catalog or outside the U.S. call: 1-503-627-1933, inside the U.S. call: 1-800-426-2200.

See Tektronix on the World Wide Web:
http://www.tek.com

ISO 9001 *Tektronix Measurement products are manufactured in ISO registered facilities.*

```
┌ Alt Commands ═══════════════════════════════════════════════════
│   Auto   Copy   Functions   Help   hardKeys   Log   Measure   Program
│     Run   Setup   When   eXit   Zoom
┌══ Terminal Window ═══════════════════════════════════════════════
VM700> execute Auto
VM700> getresults RSYA RBVP RBVI RSVP RBAP RVAI
Auto
VM700> show Auto
Channel B      Source   System Default      Tue May 14 11:26:11 1991
                              VM700A Video Measurement Set
System Default                               Violated Limits
                                           Lower  Upper
Sync Amplitude          39.7  IRE                            100 IRE = 714 mV
Blanking Variation     ------ % Carr                         ZC Pulse Unselected
Blanking Variation       0.8  IRE                            100 IRE = 714 mV
Sync Variation         ------ % Carr    **     0.0    5.0    ZC Pulse Unselected
Burst Amplitude         96.3  % Sync
Burst Amplitude         38.2  IRE                            100 IRE = 714 mV
VM700>



        VM700A in Remote     Display On     Printer Off    File:
```

Terminal Window.

REQUIRED HARDWARE
VMT will operate on any IBM PC, PC XT, PC AT, or compatible. Minimum requirements are 512 K of memory, 5.25 in. or 3.5 in. floppy drive; a hard disk is desirable.

REQUIRED SOFTWARE
IBM PC DOS or MS DOS version 3.0 or higher.

REQUIRED HARDWARE
The VMBKUP programs will run on an IBM PC, PC XT, PC AT, Tektronix PEP 301 or compatible with the following requirements: 640 K memory, 5 floppy disk drive, hard disk drive; 80-column display.*1
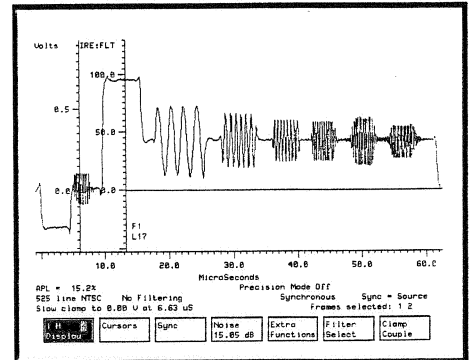
REQUIRED SOFTWARE
IBM PC-DOS or MS-DOS version 2.0 or greater is required. However, some capabilities are not available with DOS versions below 3.0. *1

1 IBM PC, PC XT, PC AT, and PC-DOS are registered trademarks of International Business Machines Corporation.

MS-DOS is a registered trademark of Microsoft Corporation.

The SLIP driver is copyrighted by FTP Software, Inc.

REQUIRED HARDWARE
VMREMGR will operate on any IBM PC, PC XT, PC AT or compatible. Minimum requirements are 512 K of memory; 5.25 in. or 3.5 in. floppy drive; VGA display and monitor; a two or three button mouse, serial or bus; a hard disk is desirable.

REQUIRED SOFTWARE
IBM PC DOS or MS DOS version 3.0 or higher.