TEK Measurement Manual

Part No. 070-8167-00
Product Group 21

VM 700A
OPTION 11 (PAL)

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OPERATOR'S SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

Terms In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property or loss of data.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

Terms As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property, including the equipment itself. Refer to the manual for information.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

Protective ground (earth) terminal.

SAFETY INFORMATION

Use the Proper Power Source. This product is intended to operate from a power source that will not apply more than 250 V rms between the supply conductors or between either supply conductor and ground. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Ground the Product. This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Danger May Arise From Loss of Ground. Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use the Proper Fuse. To avoid fire hazard, use only the fuse of correct type, voltage rating, and current rating as specified in the parts list for your product. Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres. To avoid explosion, do not operate this product in an explosive atmosphere.

Do Not Remove Covers. To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

Section 1
INTRODUCTION

The VM700A Option 11 (PAL) gives you access to a large variety of interactive ("Measure mode") and automatic ("Auto mode") measurements.

Measure mode measurements are user-selectable, interactive, graphical applications that make measurements on video signals. Chapter 2, *MEASURE MODE MEASUREMENTS* of this manual describes each Measure mode measurement.

Pressing the VM700A's front-panel Measure button displays Measure mode, showing the names of available measurements.

Rotating the control knob scrolls the Measure mode display to show more measurements.

Touching the name of a measurement in the Measure mode display begins execution of that measurement and unfreezes the display if it was frozen.

Pressing any major mode button (for example, Waveform, Vector, Picture, Measure, or Auto) when a measurement runs ends that measurement and returns to the appropriate major mode display.

Auto mode measurements are measurements taken when the VM700A is in "Auto mode," wherein it continuously repeats a set of user-selectable measurements and reports when a measurement falls outside user-defined limits. Auto mode is usually used to monitor video signals and alert someone when one or more parameters drifts out of pre-defined limits. Section 3, *AUTO MODE MEASUREMENTS,* describes each Auto mode measurement.

Pressing the VM700A's front-panel Auto button displays Auto mode, showing the Auto mode measurements that will be performed continuously, until the VM700A is taken out of Auto mode.

Pressing any major mode button (for example, Waveform, Vector, Picture, Measure, or Auto) when a measurement runs ends that measurement and returns to the appropriate major mode display.

The specifications for the VM700A's PAL measurements, in both Measure and Auto modes, are listed in Section 4, *PAL MEASUREMENT SPECIFICATIONS*.

Section 2
MEASURE MODE MEASUREMENTS

INTRODUCTION

The VM700A's Measure Mode gives you a large selection of interactive, graphical measurements that you can perform on video signals. To access Measure Mode, press the Measure button on the VM700A front panel.

Table 2-1 shows the available Measure Mode measurements and the signal qualities measured. The measurements are presented in alphabetical order in this section.

Table 2-1
Measure Mode measurements and signal qualitites

Timing Measurements	
Burst Frequency	Burst frequency error
H_Blank	Horizontal blanking over field
H_Timing	All horizontal timing parameters
Jitter	H Sync jitter within a frame
Jitter Long_Time	Frame jitter
Line Frequency	Line frequency error
SCH_Phase	SubCarrier-to-Horizontal (SCH) Phase
V_Blank	Vertical interval timing and pulse positions
Non-Linear Distortion Measurements	
Chrominance NonLinearity	Chrominance non-linear phase & gain
DGDP	Differential gain & phase
Luminance Non-Linearity	Differential luminance
Linear Distortion Measurements	
Bar LineTime	Line time distortion
Bounce	Long time distortion
ChromLum GainDelay	Chrominance-to-luminance gain & delay inequality
GroupDelay SinX_X	Frequency response, group delay (both with SinX/X signal)
K_Factor	Short Time Distortion (K_{2T} pulse/bar ratio)
MultiBurst	Frequency response (with MultiBurst signal)
TwoField	Field time distortion
Noise Measurements	
Chrominance AMPM	Chrominance noise (AM & PM components)
Noise Spectrum	Signal-to-noise ratio (various weighting filters available)

Table 2-1
Measure Mode measurements and signal qualitites (cont'd)

Miscellaneous	
ColorBar	From color bar signal: luminance level, chrominance level, chrominance phase
ICPM	Incidental Carrier Phase Modulation
Level Meter	Amplitude difference between two points

BAR LINETIME

Bar LineTime measures bar and sync amplitudes, as well as line time distortion.

The Bar LineTime display (Figure 2-1) plots the bar signal level on the y-axis, and time on the x-axis. The default y-axis level labeled "100%" is determined from the difference between the bar top, or level of the bar signal at the center of the bar (for example, the time halfway between the 50% rising edge and 50% falling edge times of the bar) and the black-level reference position of the signal. Both the bar top position and the black-level reference position can be adjusted using softkeys on the Special Position sub-menu of the **Acquire** softkey.

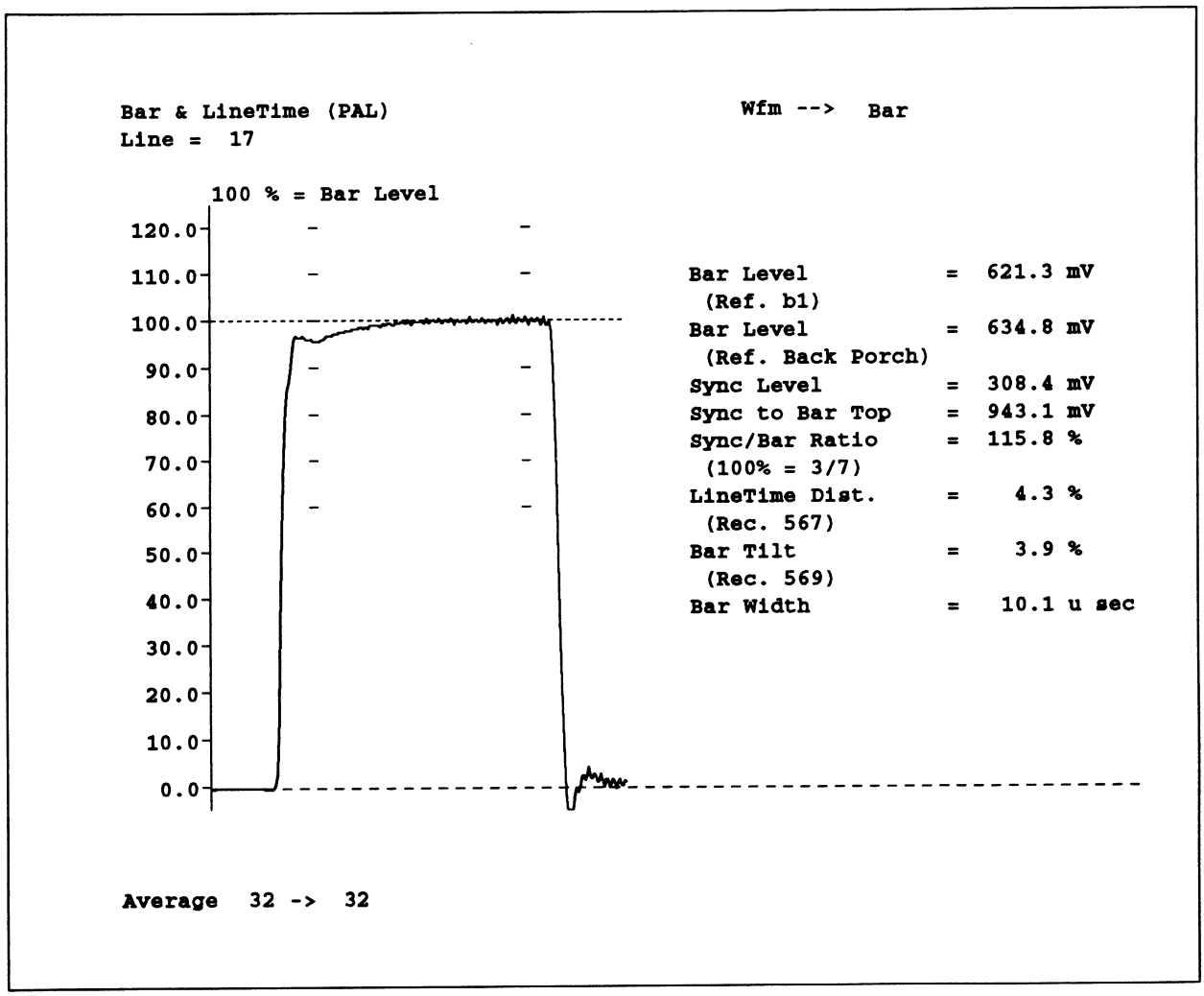

Figure 2-1. Bar LineTime display.

Numerical readouts provide measurement results in mV, %, and µsec, as appropriate. Table 2-2 describes the readouts.

Table 2-2
Bar LineTime measurements

Measurement	Description
Bar Level (ref. b1)	Bar top amplitude relative to the Black Level Reference (b1) level.
Bar Level (ref. Back Porch)	Bar top amplitude relative to the back porch.
Sync Level	Sync tip amplitude relative to the back porch.
Sync to Bar Top	Bar Level (ref. Back Porch) plus Sync Level value.
LineTime Dist.	Percentage of maximum deviation from the bar level.
Bar Tilt (Rec. 569)	Percentage of difference at the end points, which are measured 1 µs after the 50% level of the rising edge and 1 µs before the 50% level of the falling edge. A positive number means that the point near the falling edge is higher than the point near the rising edge.
Bar Width	Width in µsec of the bar from the 50% levels of the rising and falling edges.

If (SIS Mode) is on and the signal contains sound information in the sync tip, Sync Level and Sync to Bar Top measurements are not made and the readout displays ---.

The black-level reference and bar top positions can be changed by using the **Reference** and **Bar Pos** softkeys, respectively, in the Special Position sub-menu of the **Acquire** softkey.

Bar LineTime Menu

Pressing the Menu button when the Bar LineTime measurement runs displays the Bar LineTime menu (Figure 2-2).

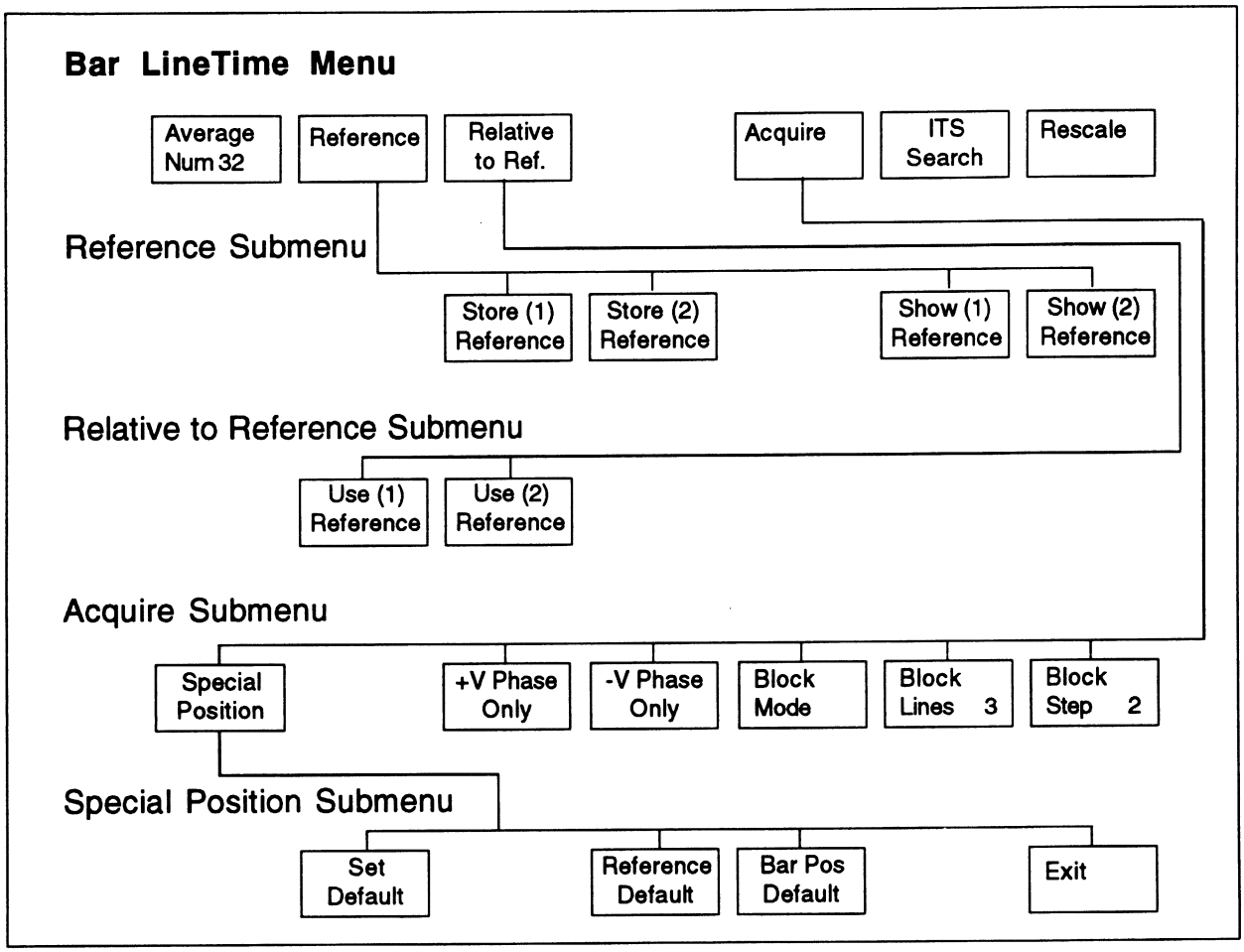

Figure 2-2. Bar LineTime menu tree;.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays a submenu that (1) stores the currently displayed values for use as a reference; or (2) displays previously stored reference values.
Relative to Ref	**Relative to Ref** displays a submenu of softkeys that selects the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the specific measurement.
ITS Search	**ITS Search** searches the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the display.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Bar LineTime measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (n) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (n) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position submenu and a waveform display (Figure 2-3) used to set the location on the waveform where the measurement is made.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.

-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

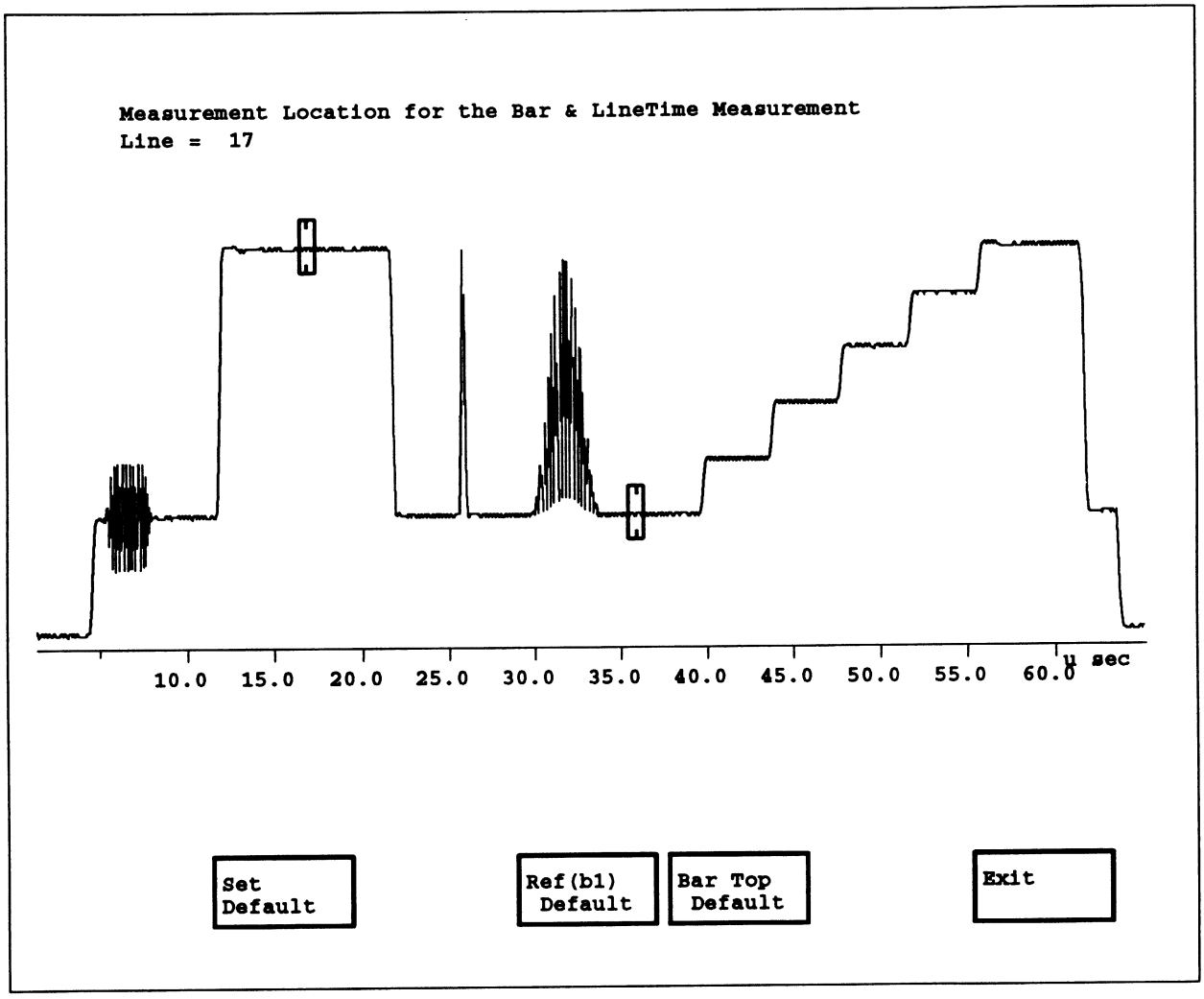

Figure 2-3. Bar LineTime special position display.

SPECIAL POSITION SUBMENU

Set Default	**Set Default** reassigns the default values to the **Reference** and **Bar Position** softkeys. To reassign the default value to one of the position softkeys, select that softkey before touching **Set Default**.
Ref. (b1)	**Ref. (b1)** sets the black level, or zero, measurement location. The default measurement location varies with the signal type.
Bar Pos.	**Bar Pos.** sets the measurement location of the bar level. The default measurement location is the halfway point between the 50% rising edge and the 50% falling edge times of the bar.
Exit	**Exit** leaves the Special Position submenu and displays the Bar LineTime display.

BOUNCE

Bounce measures low-frequency distortion. Figure 2-4 shows a typical Bounce measurement display. The display graphs three signal levels: the Average Picture Level (APL) at the top, the back porch, or "burst" level (measured at center of burst) in the middle, and the sync tip level at the bottom. The < mark indicates the 0.0 Volts level.

Numerical readouts include:

- **PK. dev.** gives the % of bounce on the burst signal relative to the amplitude of the bounce signal.
- **Settle** to gives the time (in seconds) that the signal takes to settle to the reference percentage.
- **Expect** gives the expected low and high percentage of the average picture level (APL), based on the current pattern.

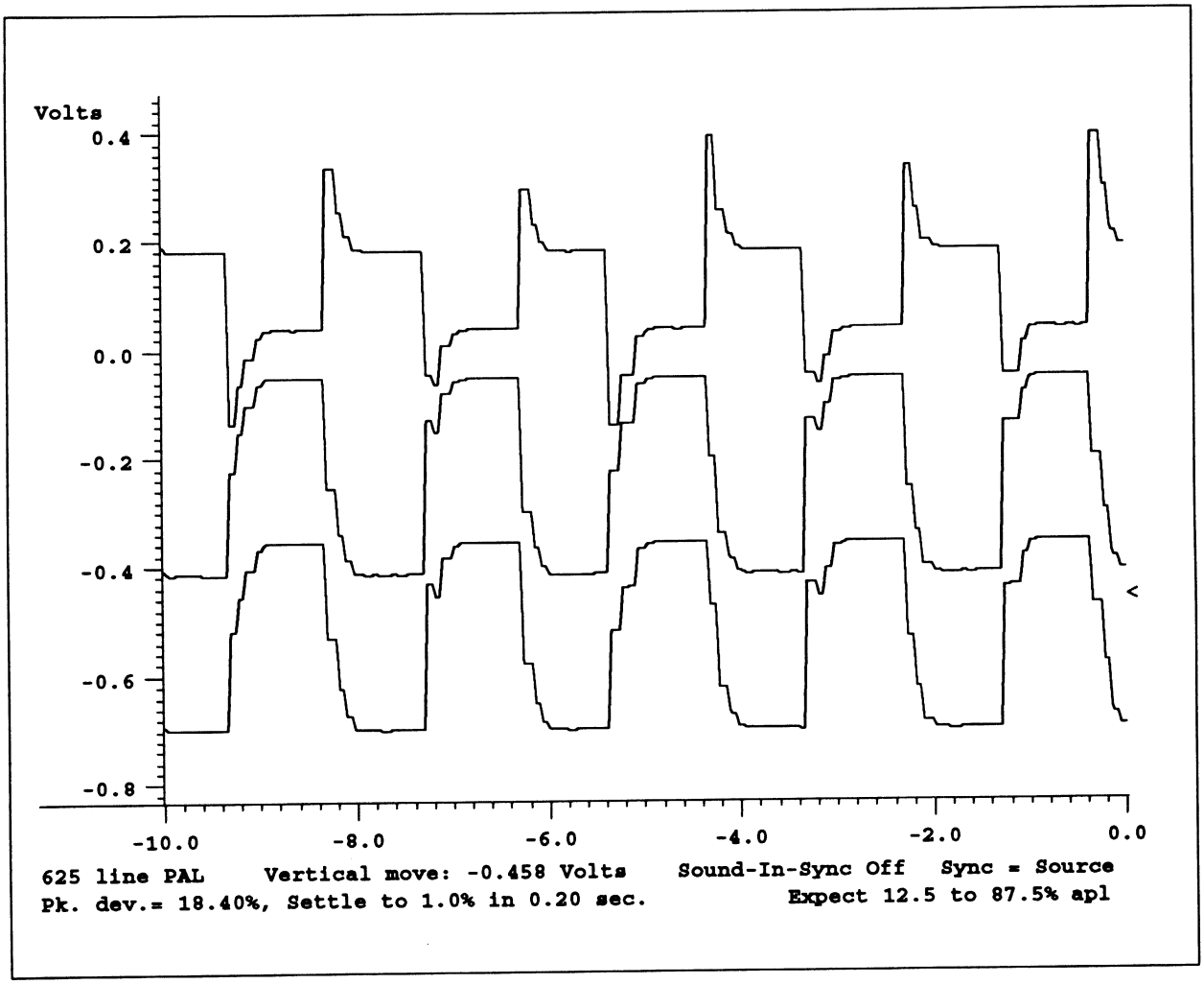

Figure 2-4. Bounce display.

Bounce Menu

Pressing the Menu button when the Bounce measurement runs displays the Bounce menu (Figure 2-5).

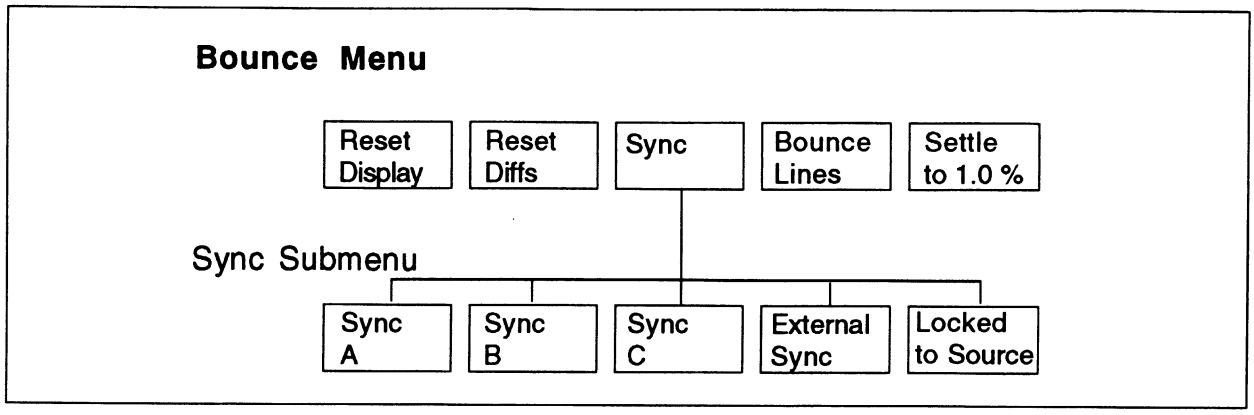

Figure 2-5. Bounce menu tree.

MAIN MENU

Reset Display	**Reset Display** restores the display to the initial scaling..i.Bounce:Main menu:Reset Display, 2-;.i.Reset Display softkey, 2-;.i.softkeys:Reset Display, 2-;
Reset Diffs	**Reset Diffs** resets the Vertical Move readout to 0.0, so that any vertical displacement of the Bounce waveform by the knob will be measured. This is useful for measuring amplitudes of features when Freeze is engaged.
Sync	**Sync** displays a group of softkeys that select the type of sync.
Bounce Lines	**Bounce Lines** causes only the bounce lines to be displayed. (The usual Bounce signal includes three bounce lines to one 50% APL reference signal.)
Settle to %	**Settle to %** sets the reference percentage. When the Bounce signal source is a generator and the % reference is 0.6% or greater, the Settle to time could be less than 0.1 sec., and be displayed as 0.0 sec.

SYNC SUBMENU

Reset Display	**Sync A/Sync B/Sync C** selects the corresponding input channel as the sync source.

*Touching any of these softkeys also de-selects the **Locked to Sync** softkey, so that subsequent input selection changes will not affect the sync source. This causes problems if the relative input timings of source and sync are not derived from the same video source.*

External Sync	**External Sync** selects external input as the sync source. This input cannot be displayed or measured. See warning above.
Locked to Source	**Locked to Source** when highlighted, ensures that sync and input sources are always the same. See warning above.

BURST FREQUENCY

Burst Frequency measures the Color Burst (subcarrier) frequency.

Figure 2-6 shows the Burst Frequency display. The display shows the difference between the currently measured Burst Frequency and a reference frequency. (In Figure 2-6, the Color Burst frequency of an incoming signal on Channel C was used as the reference.)

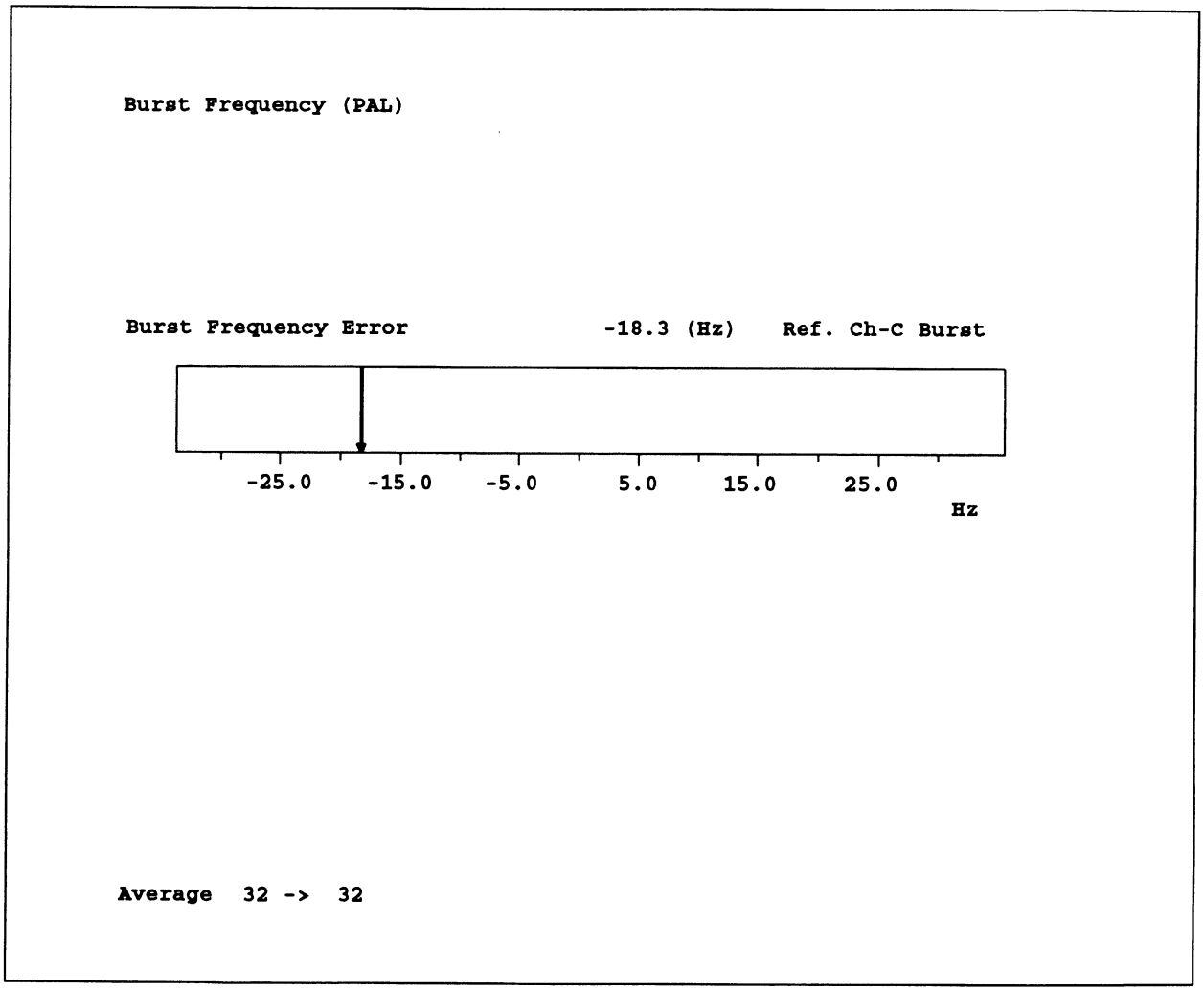

Figure 2-6. Burst Frequency display.

You can use the color burst frequency of the signal currently on another channel as a reference frequency, or you can store a reference frequency by using the Reference Internal and Zero Set softkeys that appear as a sub-menu under the **Reference** softkey. (See the *Setting the Reference Burst Frequency* topic below.)

If you use another channel's color burst as a reference frequency on a Dual-Standard VM700A or use Reference Internal, both signals should use the same standard (NTSC or PAL).

Burst Frequency Menu

Pressing the Menu button when the Burst Frequency measurement runs displays the Burst Frequency menu (Figure 2-7).

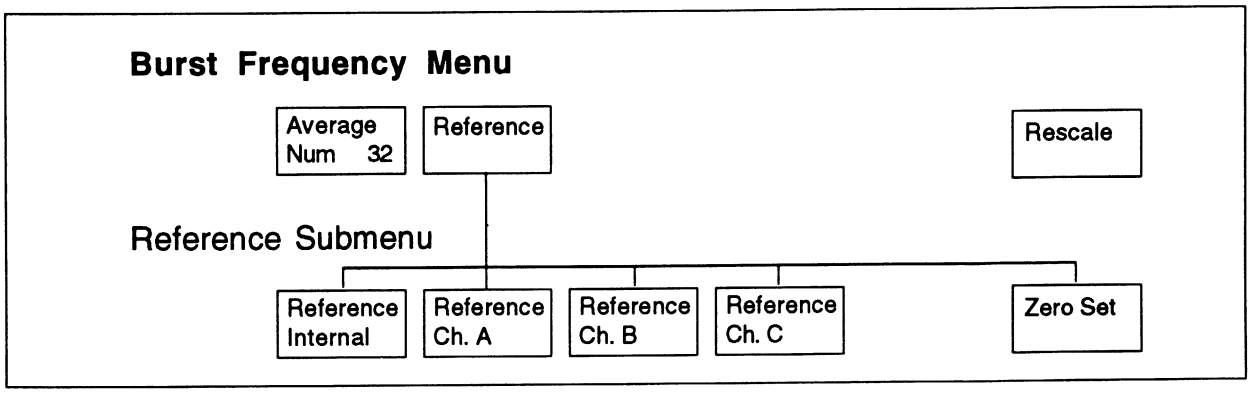

Figure 2-7. Burst Frequency menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which selects the reference source for the burst frequency.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Burst Frequency measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Reference Internal	**Reference Internal** sets the reference burst frequency to that of the internal crystal. A reference frequency stored with the **Zero Set** softkey is required for calibration.
Reference Ch. B	**Reference Ch. B** sets the burst frequency reference to Channel B.
Reference Ch. C	**Reference Ch. C** sets the burst frequency reference to Channel C.
Zero Set	**Zero Set** stores the burst frequency of the current source as the reference.

Setting the Reference Burst Frequency

You can set the VM700A's reference burst frequency when the Reference sub-menu displays.

- To use the burst frequency of a signal on another channel as a reference, touch the softkey corresponding to that channel.
- To store the color burst frequency of a signal on another channel for later use as a reference, press that channel's button on the front panel, then touch the **Zero Set** softkey. The color burst frequency of the designated signal becomes the internal reference, and remains so until the VM700A is powered down or until another reference signal is stored.
- To use the frequency of the VM700A's internal crystal as a reference frequency without calibration, disconnect any signals from the current sync source, then touch the **Zero Set** softkey.

The VM700A displays "Zero Set," followed by the date and time, followed by the message "No CAL". The stored value becomes the internal reference, and remains so until the VM700A is powered down or until another reference signal is stored.(This method of measurement is not recommended, but may be accurate enough for some purposes.)

CHROMLUM GAINDELAY

ChromLum GainDelay measures the Chrominance-to-Luminance gain ratio and delay time.

The ChromLum GainDelay measurement display provides a graphic display of chrominance-to-luminance gain and delay values. This system default measurement is made on a modulated 20T pulse. Figure 2-8 shows an ITS signal measured by ChromLum GainDelay.

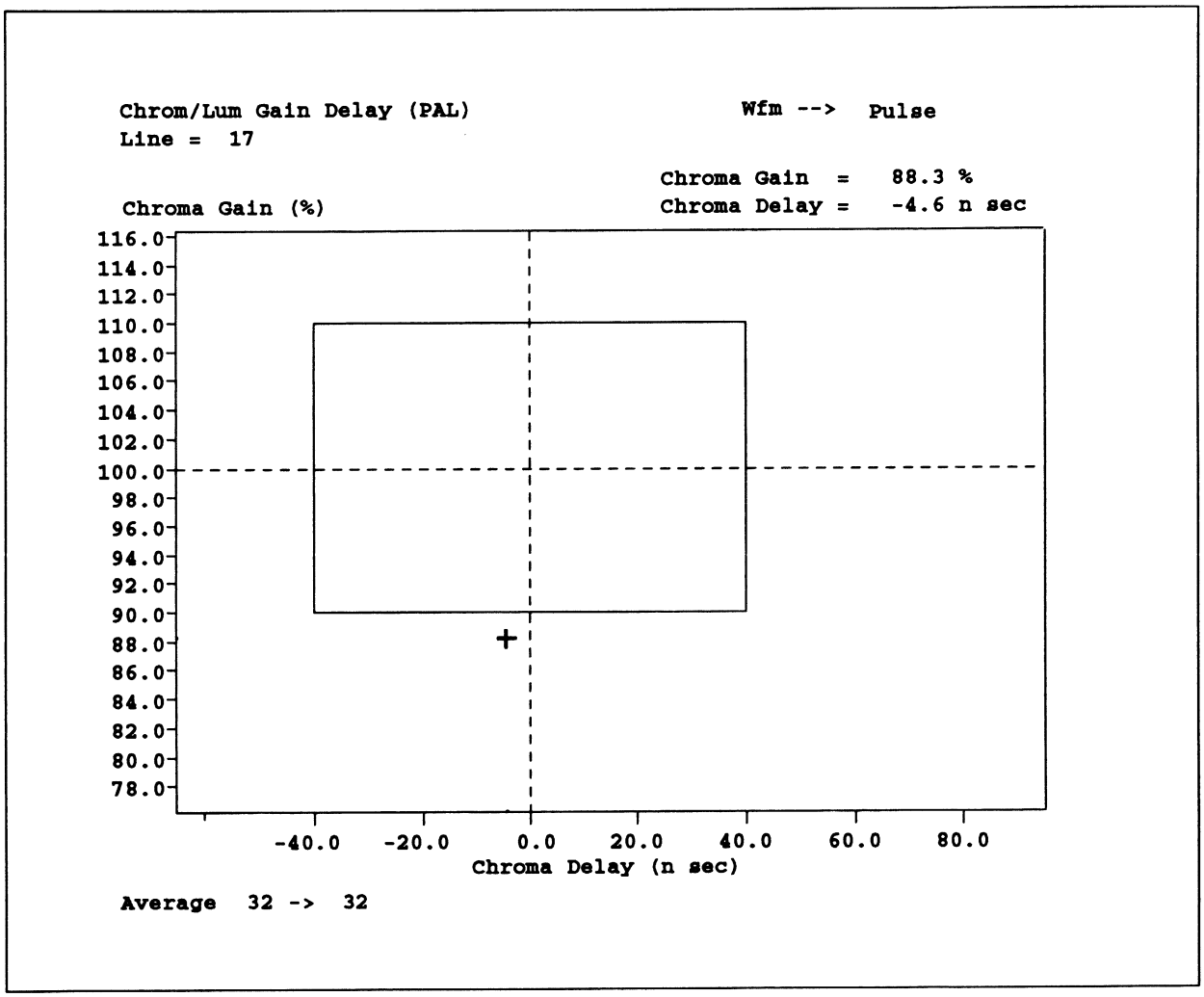

Figure 2-8. ChromLum GainDelay display.

The rectangle in the center of the display represents the upper and lower limits of the Chroma Gain (%) and Chroma Delay (ns) measurements. The left and right sides of the box correspond to the lower and upper limits of the chrominance-to-luminance delay measurement (Chroma-Lum Delay (ns) in the active Measure_Limits file). The top and bottom of the box represent the upper and lower limits of the chrominance-to-luminance gain error measurement (Chroma-Lum Gain (%) in the active Measure_Limits file). The position of the + within the box indicates delay (in ns) along the horizontal scale and gain (in %, relative to luminance) on the vertical scale.

ChromLum GainDelay Menu

Pressing the Menu button when the ChromLum GainDelay measurement runs displays the ChromLum GainDelay menu (Figure 2-9).

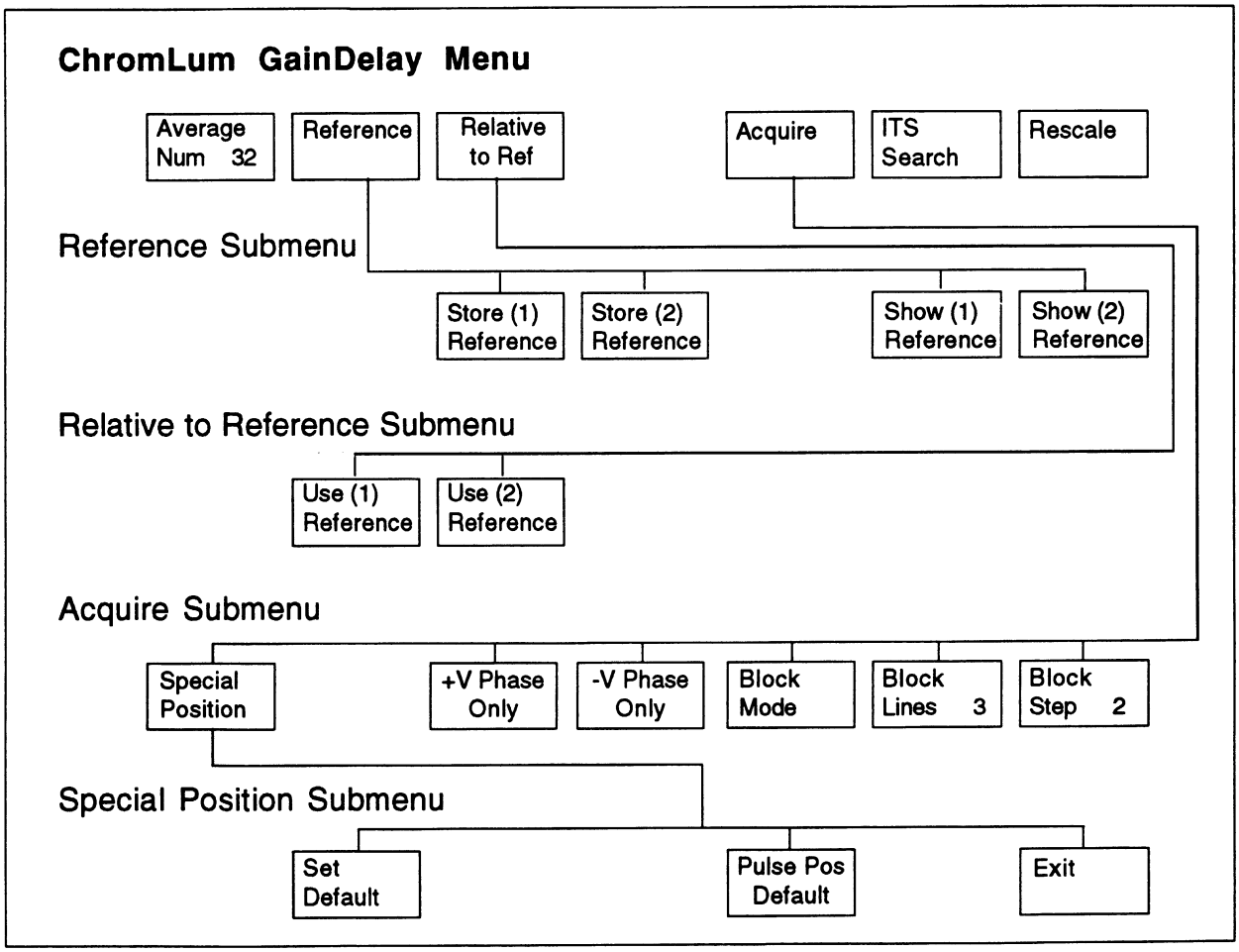

Figure 2-9. ChromLum GainDelay menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Relative to Reference	**Reference** displays the Reference submenu which selects the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the specific measurement.
ITS Search	**ITS Search** causes the VM700A to search the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the display.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the ChromLum GainDelay measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (1) Reference/ Store (2) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (1) Reference/ Show (2) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (1) Reference/ Use (2) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position submenu and a special waveform display used to set the location on the waveform where the measurement is made. Figure 2-10 shows the ChromLum GainDelay Special Position display and submenu.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.

Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Set Default	**Set Default** reassigns the default value to the **Pulse Position** softkey.
Pulse Pos	**Pulse Pos** sets the measurement location of the pulse. The default pulse position is determined automatically by the type of signal being measured.
Exit	**Exit** leaves the Special Position submenu and displays the ChromLum GainDelay display.

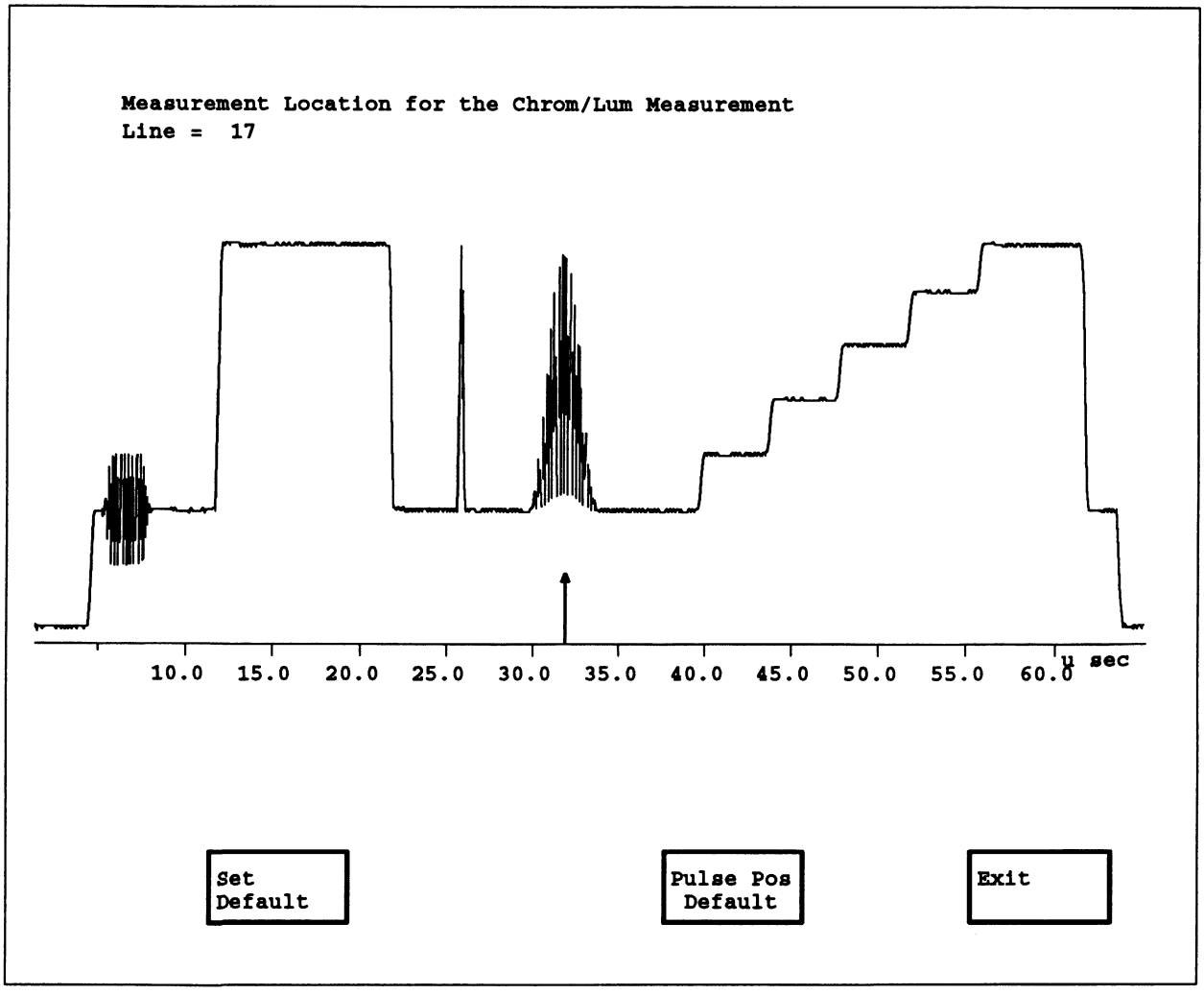

Figure 2-10. ChromLum GainDelay Special Position display.

CHROMINANCE AMPM

Chrominance AMPM measures two types of chrominance noise: the amplitude-modulated (AM) noise component and the phase-modulated (PM) noise component of the chrominance channel.

VTR's have separate chrominance and luminance channels. Most signal-to-noise measurements look only at noise in the luminance channel. Chrominance AMPM measures two types of chrominance noise: the amplitude-modulated (AM) noise component and the phase-modulated (PM) noise component of the chrominance channel. A software filter with a very sharp cut-off reduces intermodulation from the frequency-modulated fundamental of a VCR/VTR. This measurement can be made on a full field or single line of the Red Field test signal.

The default measurement bandwidth is 100 Hz to 500 kHz. High pass 100 hZ, 10 kHz, and 100 kHz filters, as well as low pass 100 kHz, 500 kHz, and 1.0 MHz filters are available by touching the Menu button and the **Filters Selection** softkey.

When using a single line for the measurement, the 100 Hz high pass filter becomes unavailable due to the lack of low-frequency components in a line.

When using Color Bursts for the measurement, 100 Hz high pass and 1.0 MHz low pass filters are automatically selected.

The values for Chrominance AM and PM are defined as:

$$\text{Chrominance AM} = 20 \log \frac{\text{AM noise}_{rms}}{V_{ref_{p\text{-}p}}}$$

$$\text{Chrominance PM} = 20 \log \frac{\text{PM noise}_{rms}}{V_{ref_{p\text{-}p}}}$$

where $V_{ref_{p\text{-}p}}$ denotes the chrominance voltage corresponding to 100% amplitude of the non-composite video signal.

Touching the **Chrominance AMPM** softkey from the Measure mode directory window displays the Chrominance AMPM display (Figure 2-11). The display features:

- two graphic "meters" that show the measured values of AM and PM noise
- digital readouts of the measurements
- graphical indicators for the upper limit values for Chrominance AM and PM Noise as specified in the current Measure_Limits file. The lines controlling these values in the Measure_Limit file are labeled Chrominance AM Noise (dB rms) and Chrominance PM Noise (dB rms), respectively, in the current Measure_Limits file.

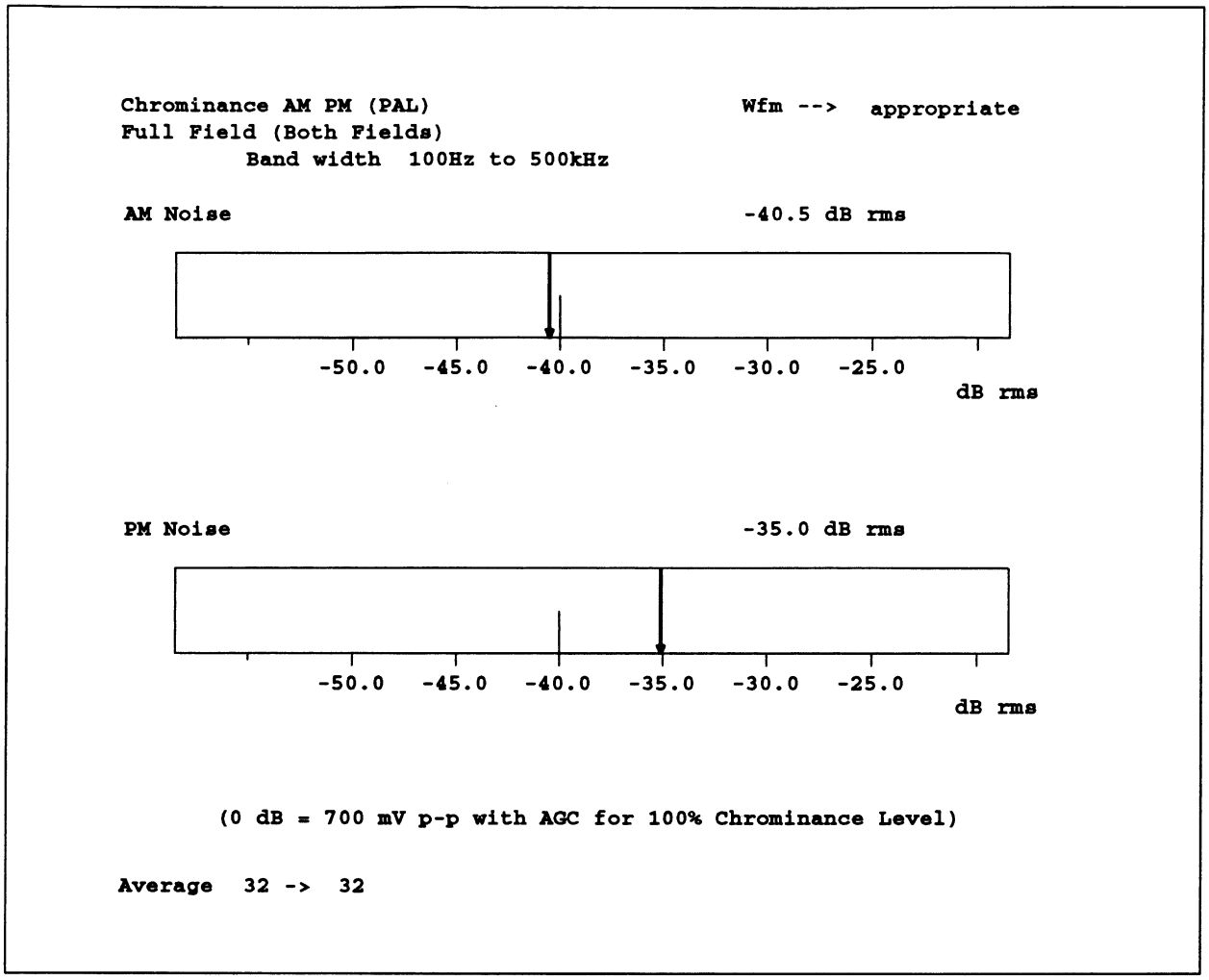

Figure 2-11. Chrominance AMPM display.

Text in the Chrominance AMPM display tells you the name of the measurement, the line number or color burst field number on which the measurement is being made, the band width specified for the measurement, the "appropriateness" of the signal for the measurement, the definition of the 0 dB level for the measurement, and whether Averaging is off or on; if on, it indicates the current weighting factor used for averaging, as well as the number of sampling points acquired.

Chrominance AMPM Menu

Pressing the Menu button when the Chrominance AMPM measurement runs displays the Chrominance AMPM menu (Figure 2-12).

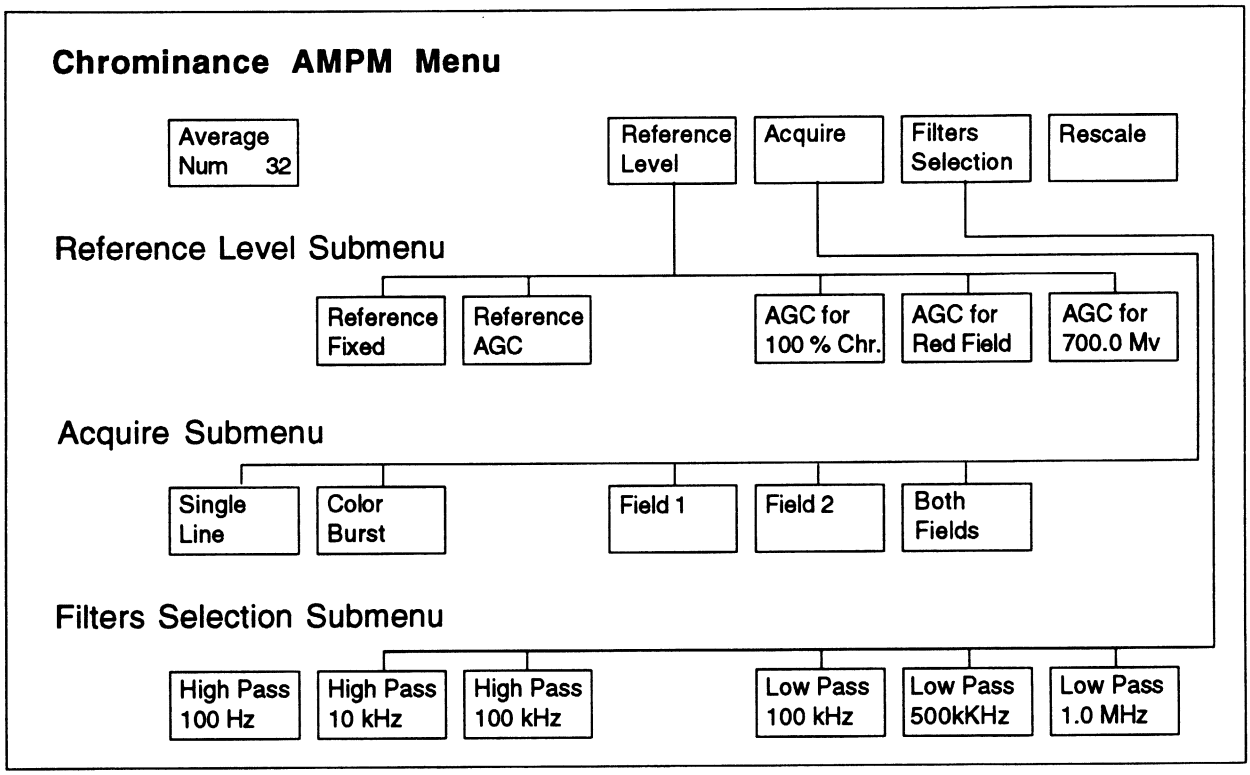

Figure 2-12. Chrominance AMPM menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference Level	**Reference Level** displays the Reference Level submenu which selects whether the measurement uses the chrominance signal amplitude as-measured, or compensates for degradation of chrominance signal amplitude (e.g., by a VCR).
Acquire	**Acquire** displays the Acquire submenu that select full field, burst, or single line acquisition, and to select field 1, field 2, or both fields.
Filters Selection	**Filters Selection** provides softkeys to select one or more noise filters for the selected source.
Rescale	**Rescale** restores the display to its default scale, with meters reading from -60 dB to -20 dB.

REFERENCE LEVEL SUBMENU

Reference Fixed	**Reference Fixed** measures chrominance noise using the chrominance signal amplitude as-measured.
Reference AGC	**Reference AGC** measures chrominance noise while compensating for degradation of chrominance signal amplitude according to the AGC option selected.
AGC for Burst	**AGC for Burst** displayed when Reference AGC is selected and a color burst is being acquired. Touching this softkey compensates for chrominance signal amplitude degradation by an amount relative to the level of the Color Burst signal (300 mV peak-to-peak); the effective chrominance signal amplitude becomes 300mV measured chrominance signal amplitude.
AGC for 100% Chr	**AGC for 100% Chr.** displayed when Reference AGC is selected and a single line is being acquired. Touching this softkey compensates for chrominance signal amplitude degradation by an amount relative to the level of the average measured chrominance level; the effective chrominance signal amplitude becomes 700mV measured chrominance signal amplitude.
AGC for Red Field	**AGC for Red Field** displayed when Reference AGC is selected and a single line is being acquired. Touching this softkey compensates for chrominance signal amplitude degradation by an amount relative to the level of the IEC 883 Red Field level (664mV); the effective chrominance signal amplitude becomes 664mV measured chrominance amplitude.
AGC for xxx mv	**AGC for xxx mV** compensates for chrominance signal amplitude degradation by an amount relative to a user-specified value (which can be set with the knob); the effective chrominance signal amplitude becomes a user-specified value measured chrominance amplitude.

ACQUIRE SUBMENU

Single Line	**Single Line** specifies that the measurement is to be made on a single line. The 100 Hz high pass filter is not available for this measurement.

Color Burst

Color Burst specifies that the measurement is to be made on the Color Burst signal. The 100 Hz high pass and 1 MHz low pass filters are automatically selected.

Field 1

Field 1 specifies that the measurement is to be made only on field 1.

Field 2

Field 2 specifies that the measurement is to be made only on field 2.

Both Fields

Both Fields displayed unless single line is being acquired. Specifies that the measurement is to be made on both field 1 and field 2.

FILTERS SUBMENU

High Pass 100 Hz/10 kHz/ 100 kHz/ Low Pass 100 kHz/500 k Hz/1.0 MHz

High Pass 100 Hz/10 kHz/100 kHz/Low Pass 100 kHz/500 kHz/1.0 MHz selects the specified filter. Signal information lower than the specified frequency (for high-pass filtering) or higher than the specified frequency (for low pass filtering) is filtered out.

CHROMINANCE NONLINEARITY

Chrominance NonLinearity measures nonlinear distortions of both gain and phase of the chrominance channel caused by differences in chrominance amplitudes. Intermodulation between chrominance and luminance is also displayed. Separate graphs are provided for each of the three measurements.

Figure 2-13 shows the Chrominance NonLinearity display.

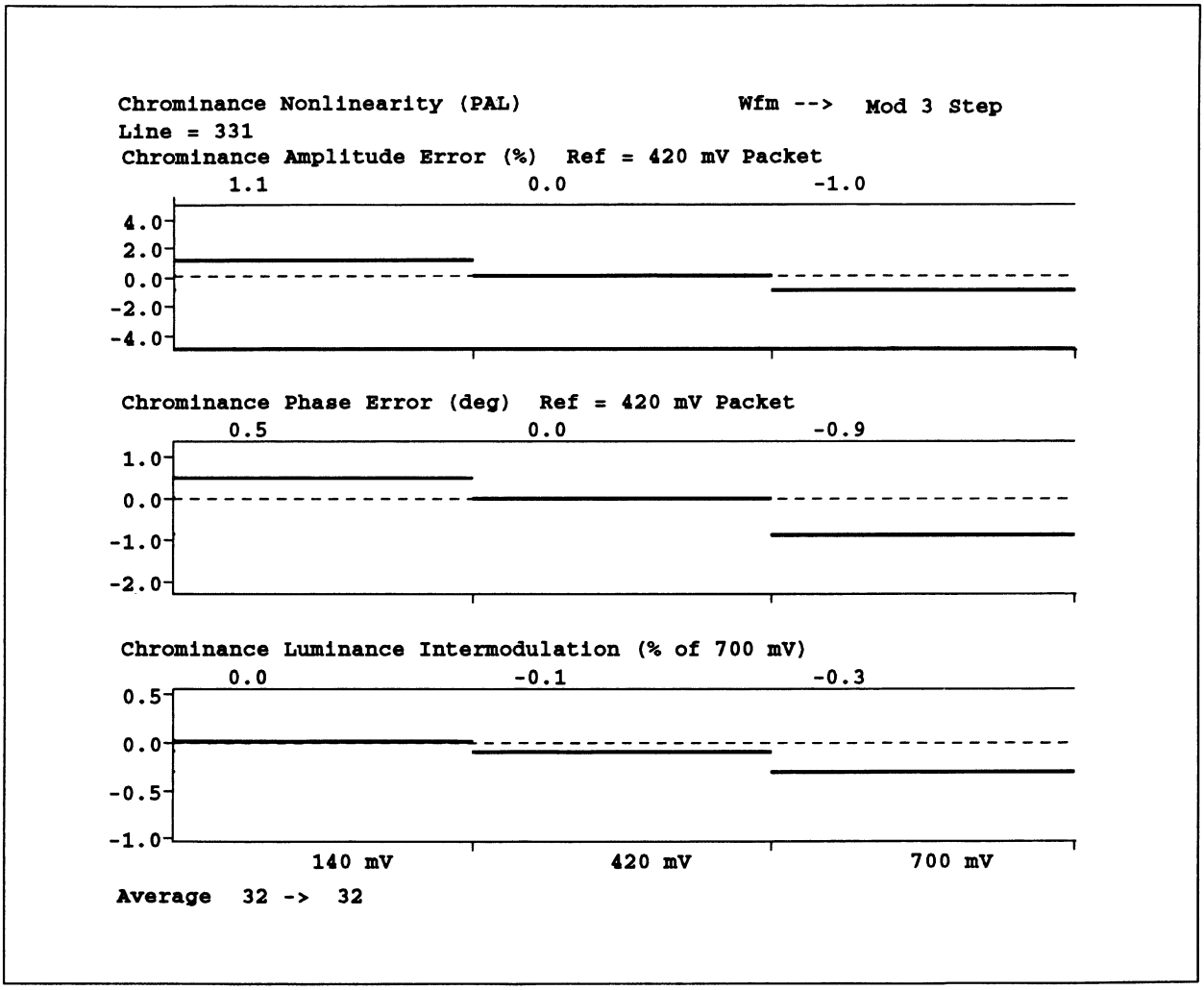

Figure 2-13. Chrominance NonLinearity display.

The Chrominance Amplitude Error (%) measurement is referenced to the center packet. The Chrominance Phase Error (deg) measurement is also referenced to the center packet, and with a normal 3-Level Modulated Pedestal signal, the results should be near 0°. The Chrominance Luminance Intermodulation measurement notes the luminance level changes that are due to changes in chrominance amplitudes. The measurement is referenced to the 700 mV level, and is expressed as a percentage of 700 mV.

Chrominance NonLinearity Menu

Pressing the Menu button when the Chrominance NonLinearity measurement runs displays the Chrominance NonLinearity menu (Figure 2-14).

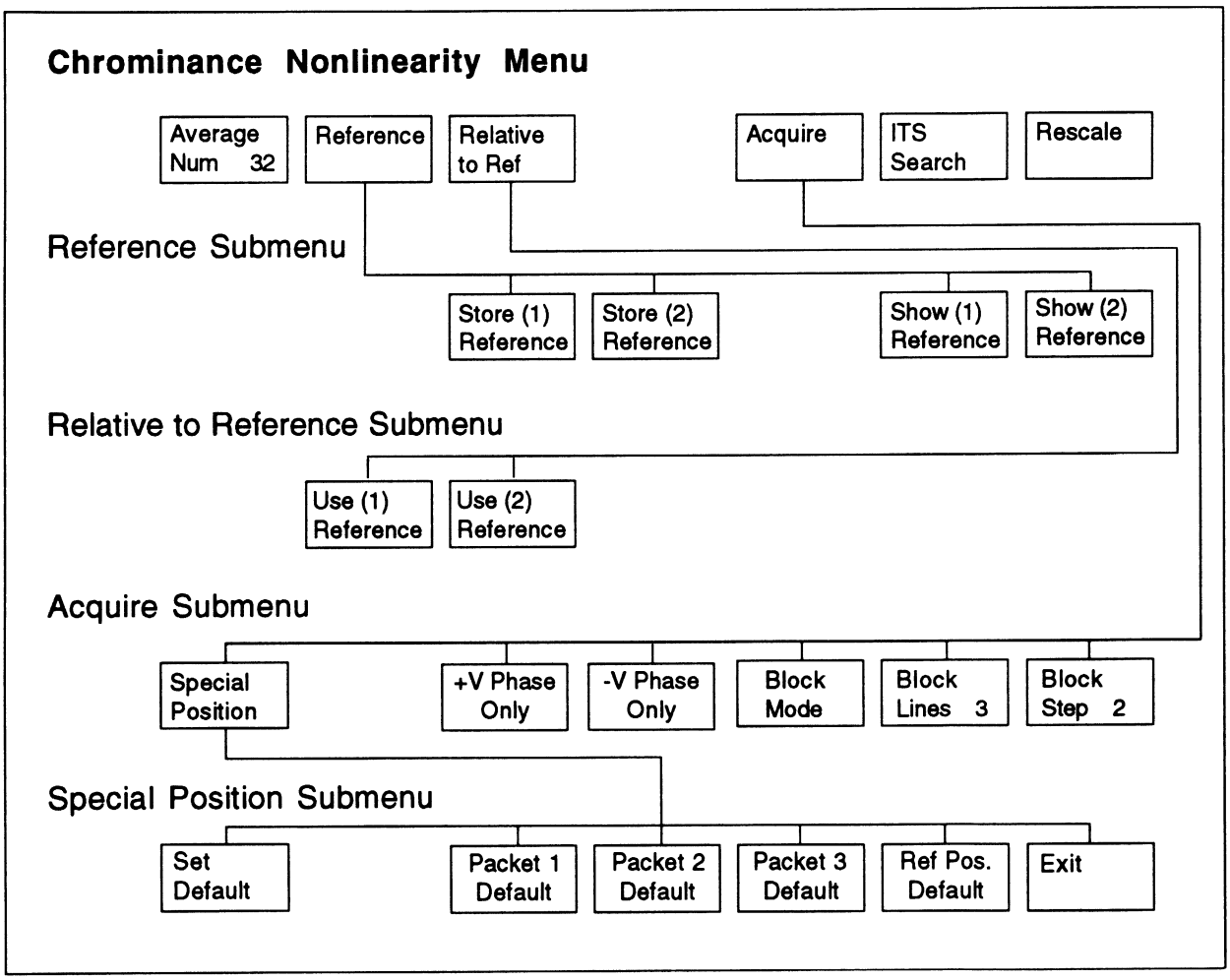

Figure 2-14. Chrominance NonLinearity menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) store the currently displayed values for use as a reference; or (2) display previously stored reference values.
Relative to Reference	**Relative to Reference** displays a submenu of softkeys to select the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the specific measurement.
ITS Search	**ITS Search** causes the VM700A to search the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the display.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Chrominance NonLinearity measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (1) Reference/ Store (2) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (1) Reference/ Show (2) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (1) Reference/ Use (2) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position submenu and a special waveform display used to set the location on the waveform where the measurement is made. Figure 2-15 shows the Chrominance NonLinearity Special Position display and submenu.

+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Set Default	**Set Default** reassigns the default values to the **Packet 1**, **Packet 2**, **Packet 3**, and **Ref Pos.** softkeys. To reassign the default value to one of the softkeys, select that softkey before touching **Set Default**.
Packet 1/2/3	**Packet 1/2/3** defines the measurement locations of the chrominance packets. The default measurement locations are automatically defined, depending on the type of signal being measured.
Ref Pos	defines the measurement location of the reference level. The default reference measurement location is automatically defined for the type of signal being measured.
Exit	**Exit**: leaves the Special Position submenu and displays the ChromLum GainDelay display.

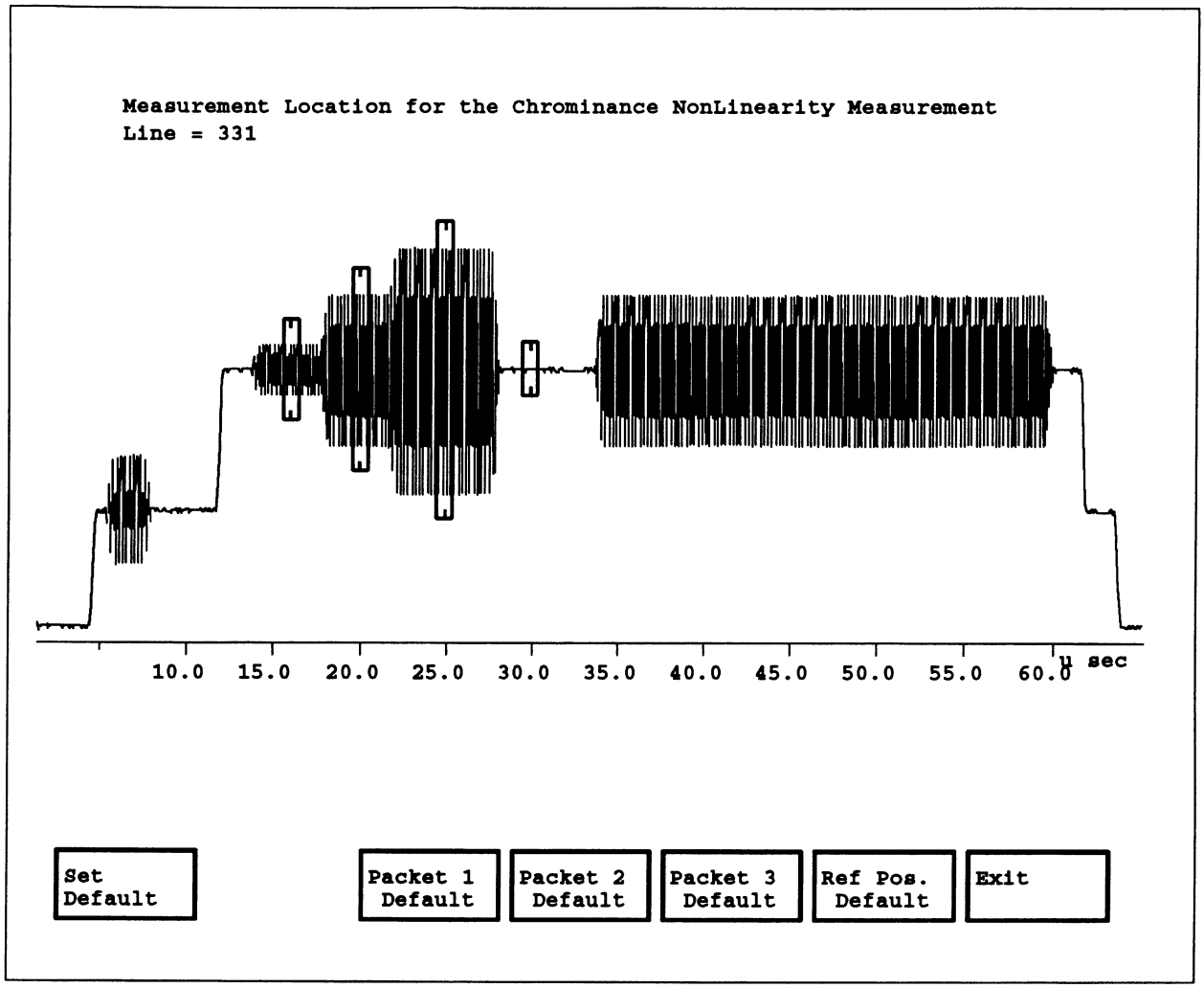

Figure 2-15. Chrominance NonLinearity special position display.

COLOR BAR

ColorBar measures the luminance level, chrominance level, and chrominance phase of each chroma packet, and displays them on three separate graticules.

ColorBar displays three measurements on three separate graticules. The top graticule shows the luminance level of each chroma packet. The middle graticule shows the chrominance level of each chroma packet. The bottom graticule shows the chrominance phase (in degrees) of each chroma packet. Each graticule includes the measurement limits (as set in the active Measurement Limits file) for each color; the limits are shown as horizontal lines that extend the width of each color. The ColorBar measurement display is shown in Figure 2-16.

The Chrominance Phase measurement is not made unless the chrominance amplitude is at least 35 mV. The message LOW CHROMA displays when chrominance amplitudes are less than this value.

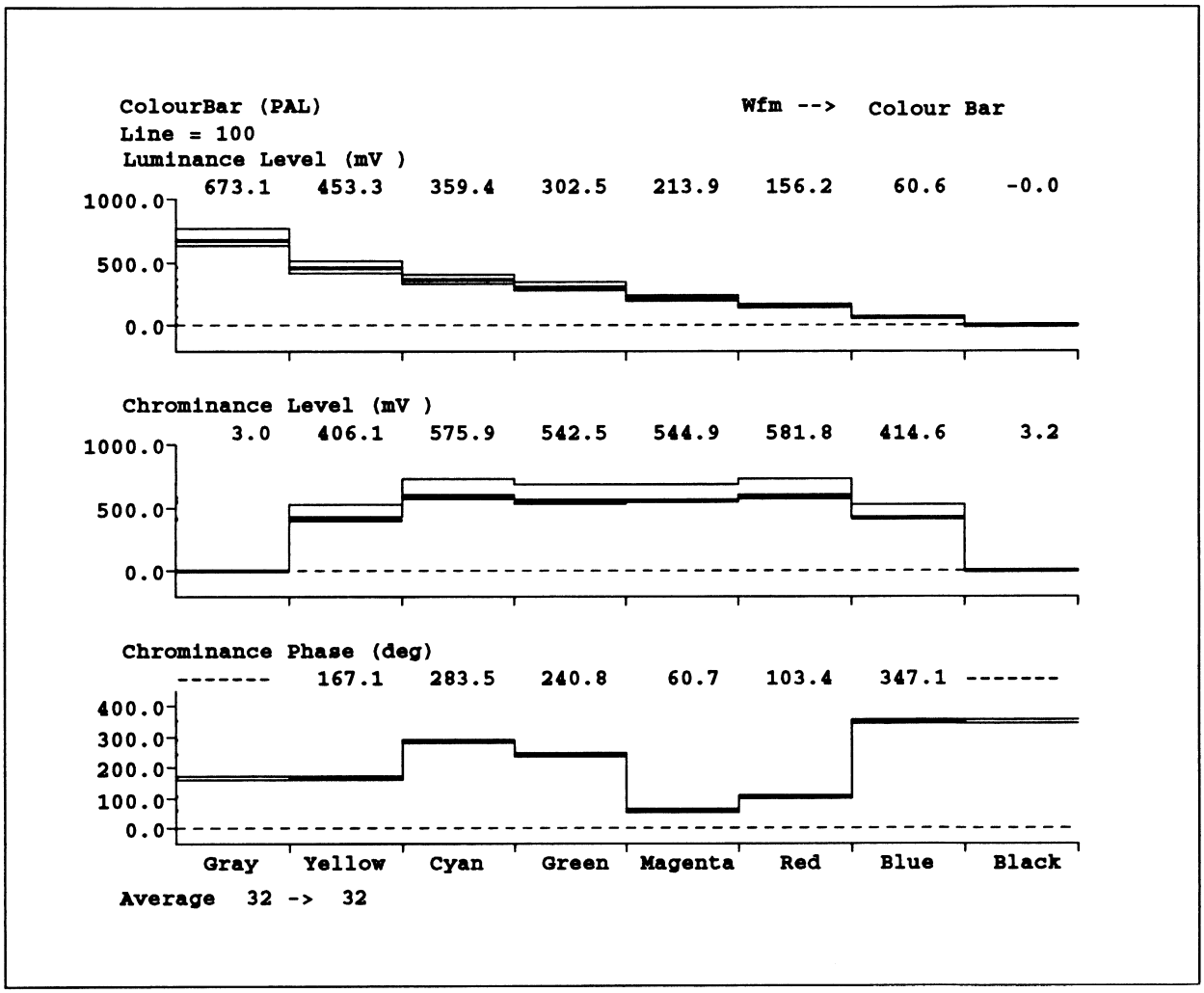

Figure 2-16. Color Bar display.

Pre-defined ColorBar References

In addition to the usual user-defined measurement references, the ColorBar measurement includes three pre-defined reference values. The pre-defined references are Ref. 100/0/75/0, Ref. 100/0/100/0, and Ref. 100/0/100/25. Table 2-3 lists the pre-defined color bar reference values.

Table 2-3.
Predefined color bar reference values

Reference Values for 100/0/75/0 Colorbars								
Parameters	White	Yellow	Cyan	Green	Magenta	Red	Blue	Black
Luma Level	700.0	465.2	368.0	308.2	216.8	157.0	59.9	0.0
Chroma Level	0.0	470.5	663.8	620.1	620.1	663.8	470.5	0.0
Chroma Phase	0.0	167.1	283.5	240.7	60.7	103.5	347.1	0.0
Reference Values for 100/0/100/0 Colorbars								
Parameters	White	Yellow	Cyan	Green	Magenta	Red	Blue	Black
Luma Level	700.0	620.2	490.7	410.9	289.1	209.3	79.8	0.0
Chroma Level	0.0	627.3	885.1	826.8	826.8	885.1	627.3	0.0
Chroma Phase	0.0	167.1	283.5	240.7	60.7	103.5	347.1	0.0
Reference Values for 100/0/100/25 Colorbars								
Parameters	White	Yellow	Cyan	Green	Magenta	Red	Blue	Black
Luma Level	700.0	640.2	543.0	483.2	391.8	332.0	234.9	0.0
Chroma Level	0.0	470.5	663.8	620.1	620.1	663.8	470.5	0.0
Chroma Phase	0.0	167.1	283.5	240.7	60.7	103.5	347.1	0.0

Color Bar Menu

Pressing the Menu button when the Color Bar measurement runs displays the Color Bar menu (Figure 2-17).

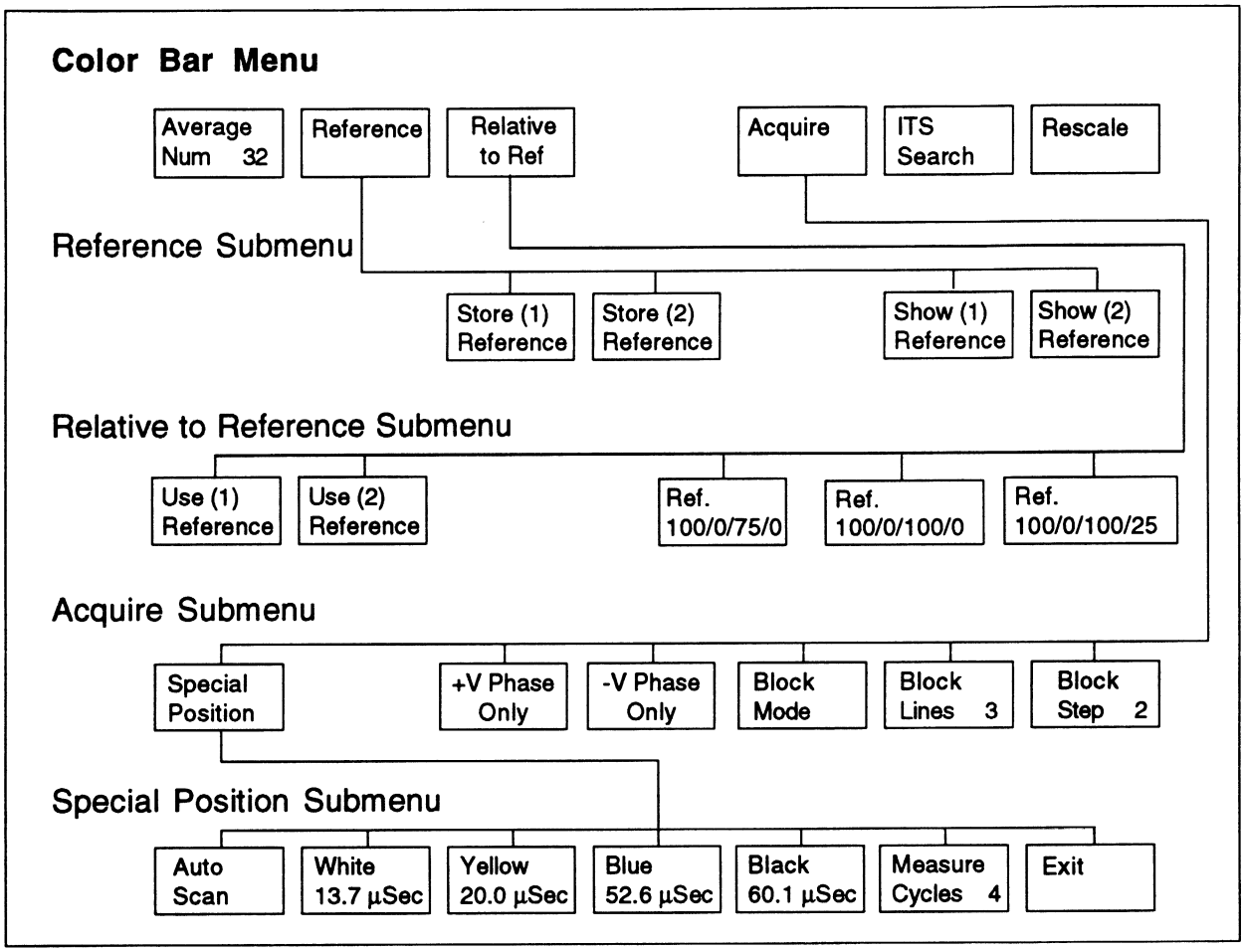

Figure 2-17. Color Bar menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) stores the currently displayed values for use as a reference; or (2) displays previously stored reference values.
Relative to Reference	**Relative to Ref** displays a submenu of softkeys to select the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Acquire	**Acquire** displays the Acquire submenu that control how the signal is acquired for the specific measurement.
ITS Search	**ITS Search** searches the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the display.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the ChromLum GainDelay measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (1) Reference/ Store (2) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (n) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.
Ref.	**Ref. 100/0/75/0 | Ref. 100/0/100/0 | Ref. 100/0/100/25** selects colorbar references with various values for saturation and setup.

ACQUIRE SUBMENU

Field Toggle	**Field Toggle** behaves the same as the **Field Toggle** softkey in Select Line mode: the system line changes to the other field, an offset of ±313 lines. Field Toggle is provided in the Acquire sub-menu because at the sub-menu level, the Select Line button only activates line selection through the control knob. (The Select Line menu does not appear when a sub-menu is in effect.)
Special Position	**Special Position** provides a group of softkeys and a waveform display used to set the locations on the waveform where the measurement is made. Figure 2-18 shows the ColorBar Special Position display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Auto Scan	**Auto Scan** When selected, scans the waveform and automatically determines measurement locations. Deselecting this softkey displays the **White, Yellow, Blue, Black,** and **Measure** softkeys.

NOTE

If severe luminance nonlinear distortion is present, the VM700A may not be able to find all the color packets expected. In such cases, you must use manual positioning to set the location of each packet.

White	**White** When selected, allows you to adjust the center position of the white color packet with the knob.
Blue	**Blue** When selected, allows you to adjust the center position of the blue color packet with the knob.
Black	**Black** When selected, allows you to adjust the center position of the black color packet with the knob.
Measure Cycles	**Measure Cycles** allows you to specify the number of chrominance subcarrier cycles measured in each chrominance packet. The width of the displayed boxes shows the entire measurement area determined by the selected number of cycles.
Exit	**Exit** leaves the Special Position display and returns to the ColorBar main measurement display.

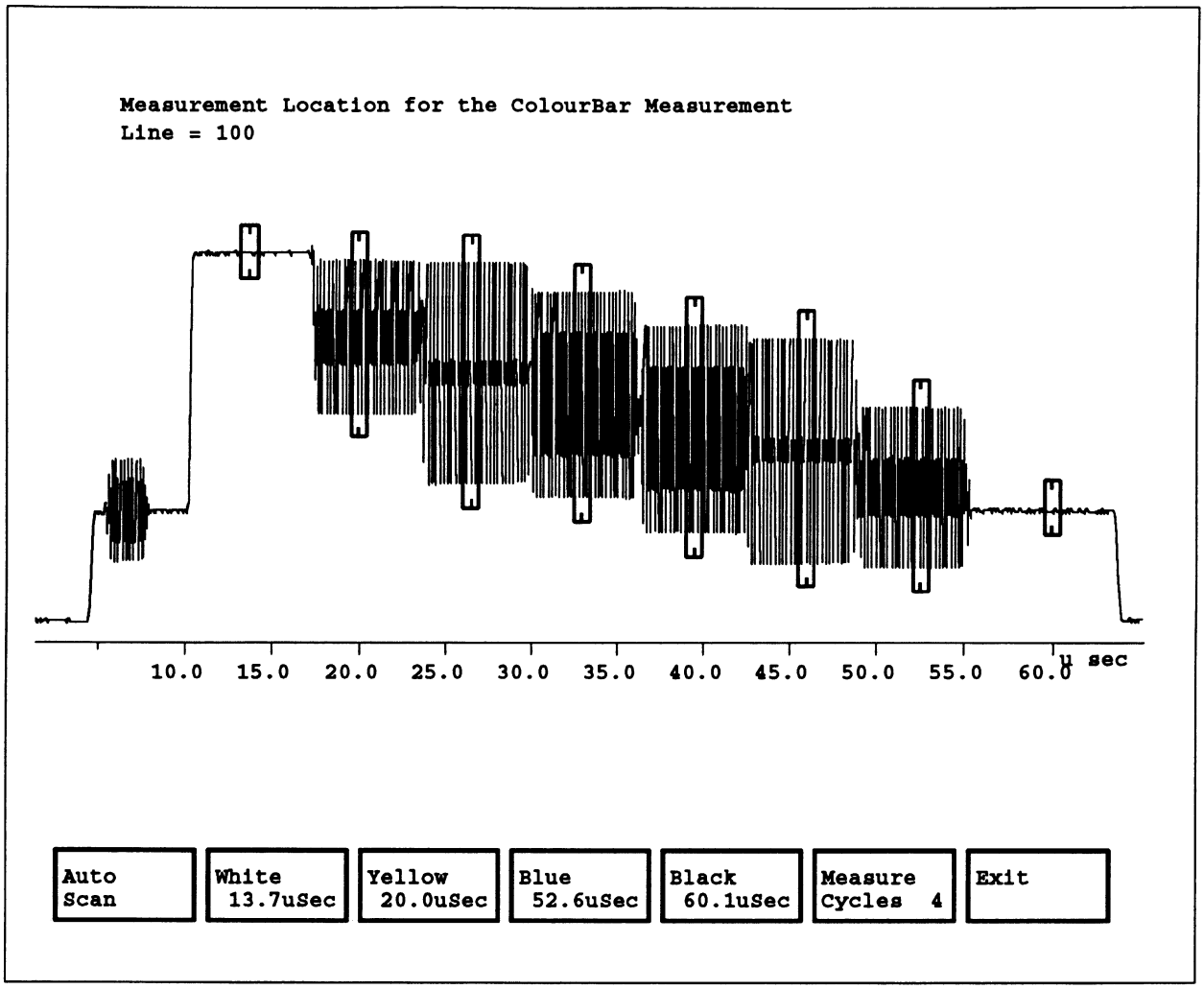

Figure 2-18. Color Bar special position display.

DGDP (DIFERENTIAL GAIN/DIFFERENTIAL PHASE)

DGDP measures differential gain and phase.

DGDP Display

Figure 2-19 shows the DGDP display. The top half plots the differential gain for each packet. A digital readout for each packet shows the differential gain value, expressed as a percentage of the reference amplitude. Additional digital readouts show the minimum and maximum differential gain values, as well as the value of the peak-to-peak amplitude (maximum minus minimum differential gain values).

The lower half plots the differential phase for each packet, expressed in degrees of phase difference from the reference packet. Additional digital readouts show the mimimum, maximum, and peak-to-peak values for differential phase.

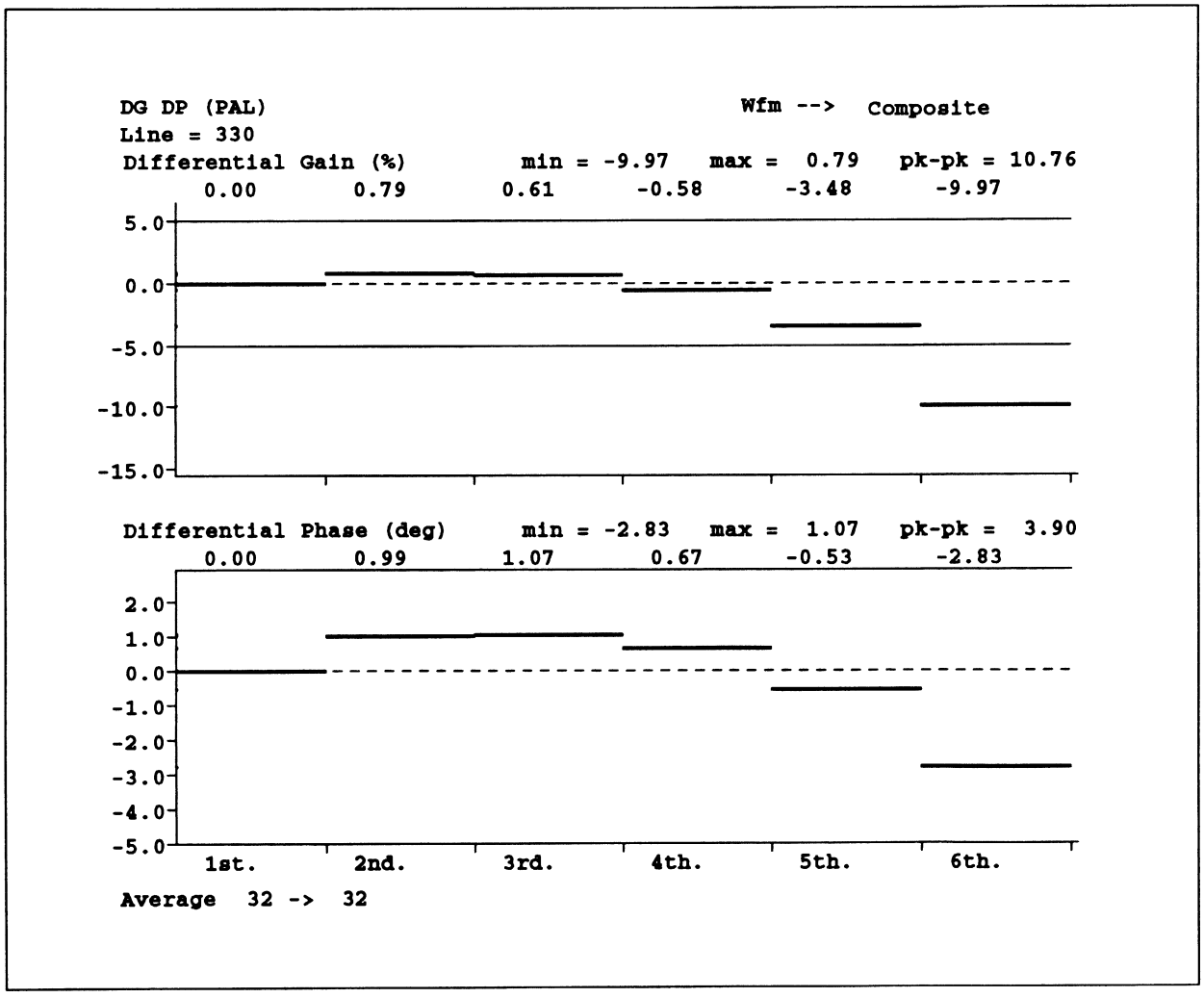

Figure 2-19. DGDP display.

DGDP Menu

Pressing the Menu button when the DGDP measurement runs displays the DGDP menu (Figure 2-20).

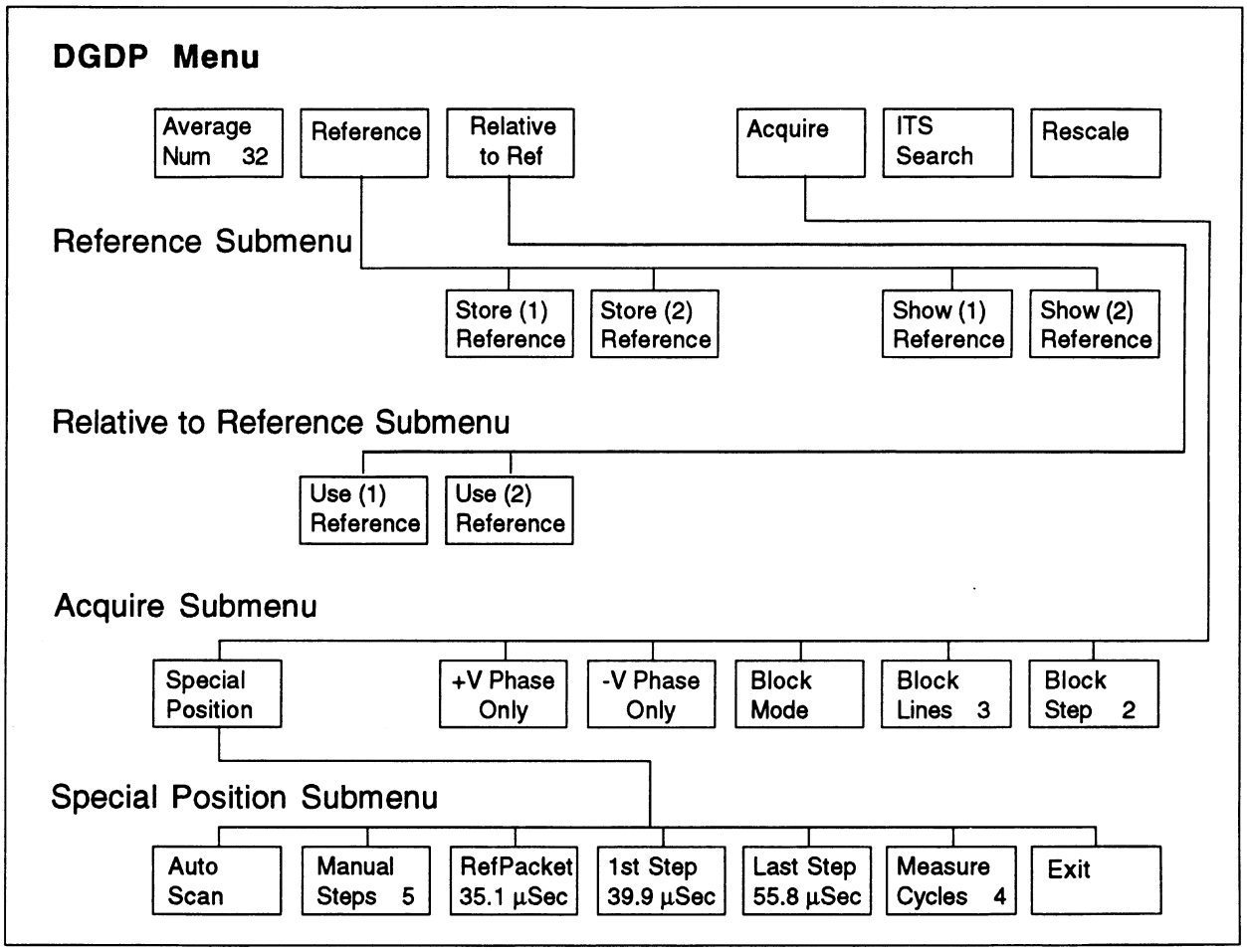

Figure 2-20. DGDP menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) store the currently displayed values for use as a reference; or (2) display previously stored reference values.
Relative to Reference	**Relative to Reference** displays the Reference submenu which selects the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the specific measurement.
ITS Search	**ITS Search** searches the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the display.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the DGDP measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (n) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (1) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position submenu that sets the locations on the waveform where the measurement is made. Figure 2-21 shows the DGDP special position display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.

-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Auto Scan	**Auto Scan** when highlighted, measurement locations are automatically scanned and determined. When de-selected, the VM700A displays softkeys to set measurement locations manually.

NOTE

If severe luminance nonlinear distortion is present, the VM700A may not be able to resolve all the steps that were present in the original signal. In such cases, you must use manual positioning to set the location of each staircase step.

Manual Steps	**Manual Steps** allows you to select the number of luminance steps in the signal by rotating the knob.
Ref Packet	**Ref Packet** allows you to select the position of the reference packet by rotating the knob. Normally, the reference packet should be the center of the first packet of the modulated staircase.
1st Step	**1st Step** allows you to select the position of the first luminance step edge of the staircase by rotating the knob.
Last Step	**Last Step** allows you to select the position of the last luminance step edge of the staircase by rotating the knob.
Measure Cycles	**Measure Cycles** allows you to select the number of chrominance subcarrier cycles measured in each chrominance packet. The width of the displayed box shows the entire measurement area determined by the selected number of cycles.
Exit	**Exit**: leaves the Special Position submenu and displays the DGDP display.

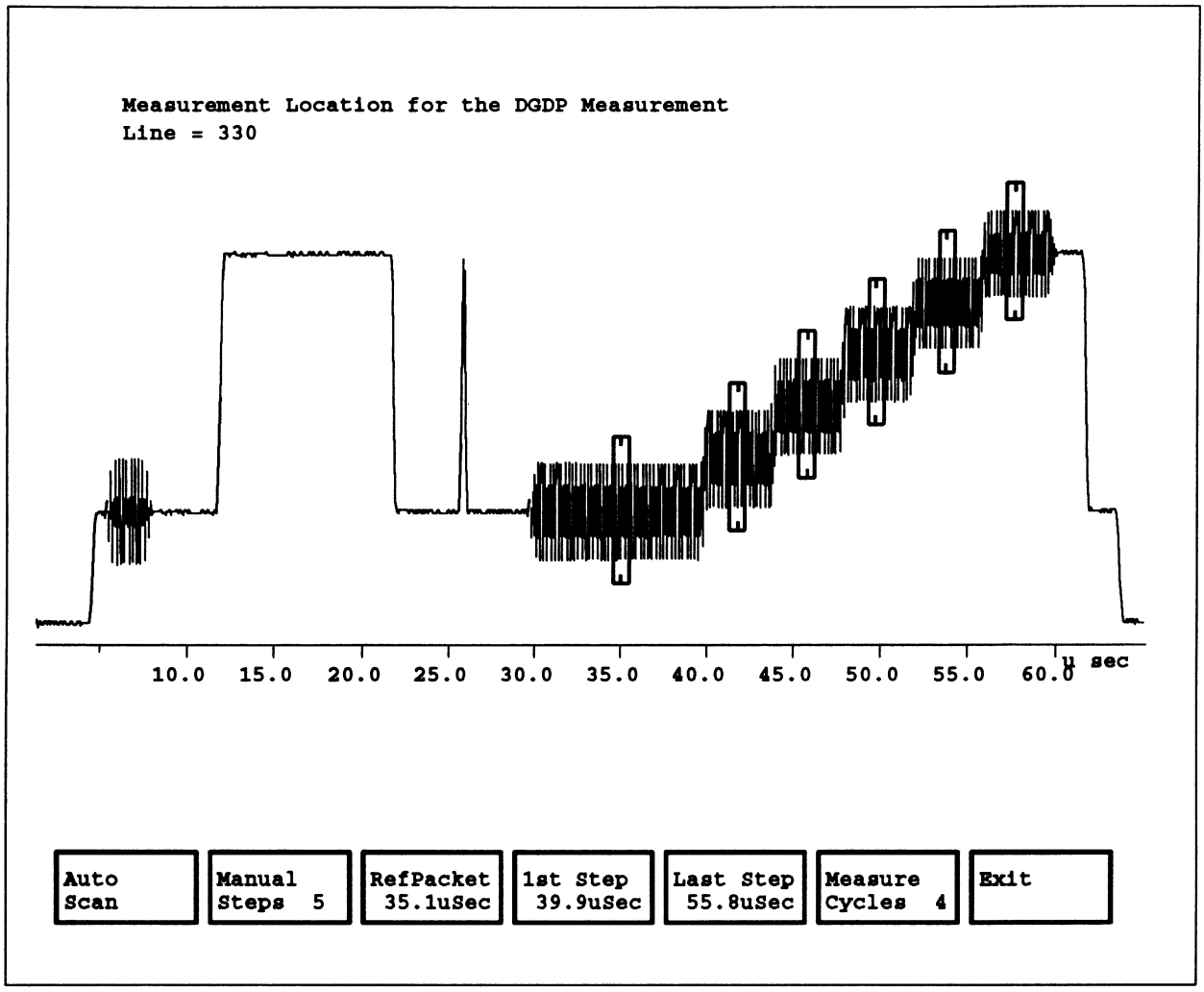

Figure 2-21. DGDP special position display.

GROUPDELAY SINX_X

GroupDelay SinX_X measures group delay and amplitude response versus frequency.

Maximum frequency in the GroupDelay SinX_X measurment is user specifiable in software version 2.05 and later.

By default, 5.8 MHz is the maximum frequency for PAL GroupDelay. The maximum frequency can be changed by defining and running a function that includes a line of the following form:

```
appset maxFreq number
```

where *number* is the new maximum frequency in MHz (use the number, but don't add the MHz — it is ignored). The new maximum frequency for GroupDelay SinX_X remains set until the VM700A is powered off. The maximum frequency can be as high as 8.5 MHz for the PAL TV standard. See the *VM700A Operator's Manual* for information on creating and running functions.

GroupDelay Sinx_X Display

Figure 2-22 shows the GroupDelay SinX_X display. The top half of the display plots amplitude (in dB) vs frequency (in MHz). The bottom half of the display plots group delay (in ns) vs frequency (in MHz).

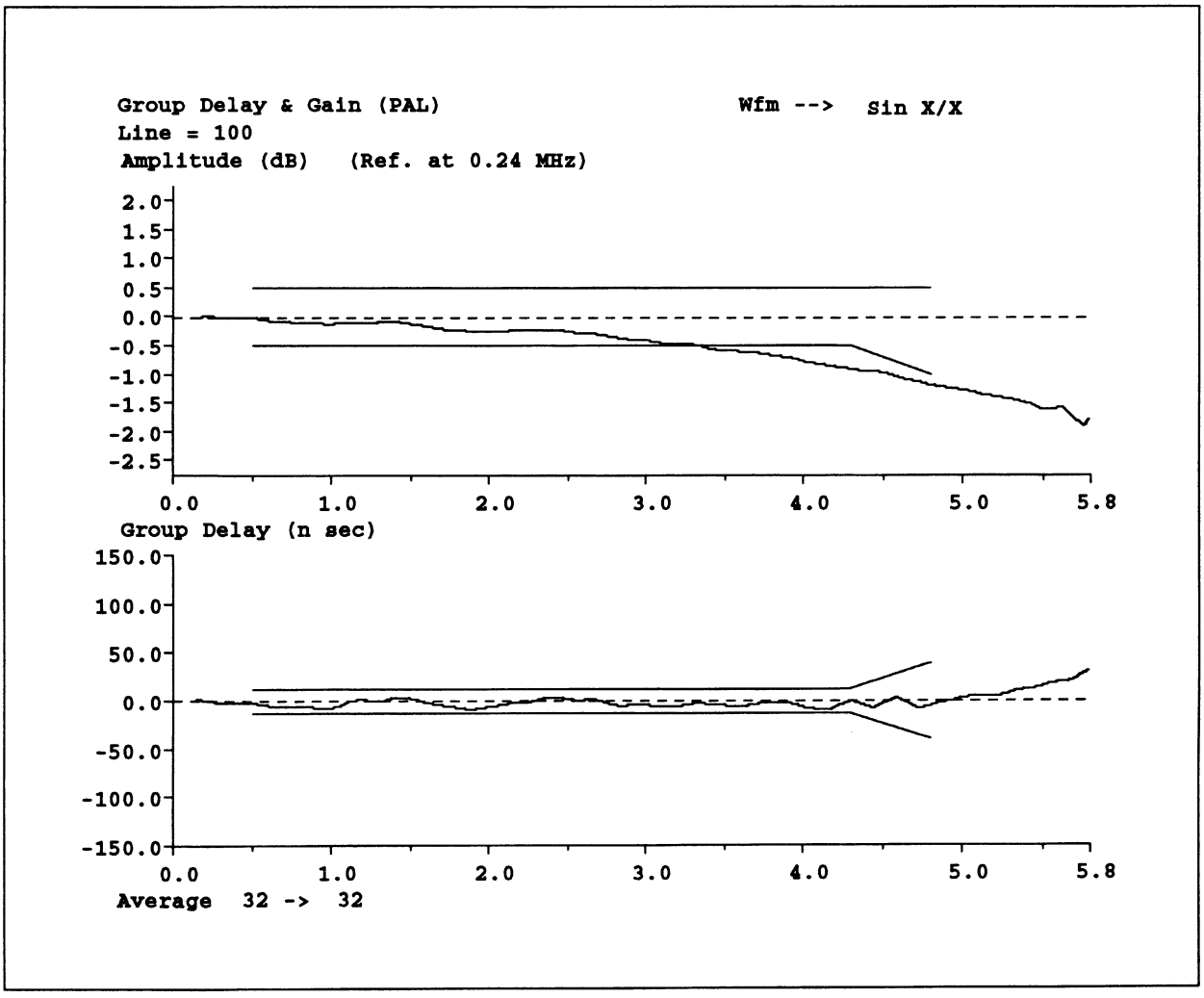

Figure 2-22. GroupDelay SinX_X display.

The GroupDelay SinX_X measurement requires a sin(x)/x signal. The measurement is set up to use a sin(x)/x signal from a 1910 signal generator (Tek TSG-271) by default; if the signal is generated by a different device, you will need to use the Special Position sub-menu of the **Acquire** softkey to specify the first and second pulse positions in the test signal. The time between the two pulses should always be a multiple of 1/(4 x fsc).

GroupDelay SinX_X Menu

Pressing the Menu button when the GroupDelay SinX_X measurement runs displays the GroupDelay SinX_X menu (Figure 2-23).

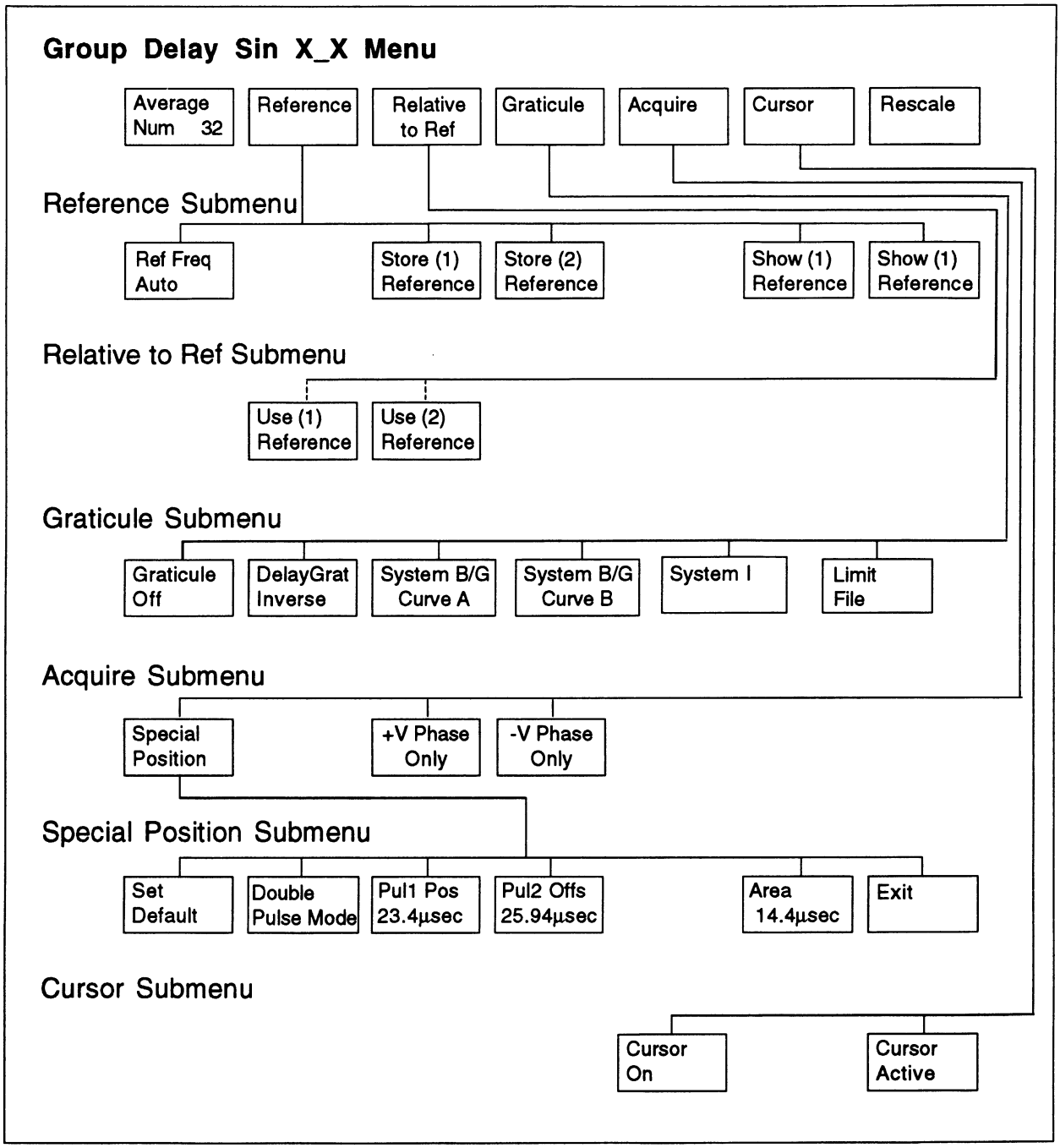

Figure 2-23. GroupDelay SinX_X menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) store the currently displayed values for use as a reference; or (2) display previously stored reference values.
Relative to Reference	**Relative to Reference** displays the Reference submenu which selects the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Graticule	**Graticule** provides softkeys to select the graticule.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the specific measurement.
Cursor	**Cursor** provides softkeys to display and activate the cursors. Readouts give the measurement values at the frequency location of the cursor. **Cursor On** when highlighted, displays the cursor. It appears in the same position it was in the last time it was active. **Cursor Active** when highlighted, allows you to move the cursor by rotating the knob.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the GroupDelay SinX_X measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Ref Freq.	**Ref. Freq.** set sthe reference value for delay and amplitude by turning the knob. Possible values are from 0.17 to 5.65 MHz. Below the 0.14-MHz level is "AUTO," which sets the reference position automatically.
Store (n) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (n) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

GRATICULE SUBMENU

Graticule Off	**Graticule Off** turns the graticule off.
DelayGrat Inverse	**DelayGrat Inverse** inverts the graticule so that it matches both the pre-correction in the transmitter and the group delay curve of the receiver.
System B/G Curve A/B	**System B/G Curve A/B** the Group Delay graticule corresponds to CCIR Rep. 624-3.
System I	**System I** selects the System I graticule.
Limit File	**Limit File** uses the values in the Measurement Limits file to create the graticule.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position submenu that sets the locations on the waveform where the measurement is made. Figure 2-24 shows the GroupDelay SinX_X display. shows the GroupDelay SinX_X special position display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**–V Phase Only** measures only the –V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Set Default	**Set Default** returns each measurement location to its default position as determined by the SinX/X signal generated by the Tektronix TSG-271 signal generator. If any other softkey is highlighted, only that measurement location is changed.
Double Pulse Mode	**Double Pulse Mode** when highlighted, the VM700A averages both upward and downward pulses, then computes the measurement. When de-selected, the VM700A uses a single upward pulse to enable this measurement with a sin^2 pulse. This softkey should normally be highlighted to avoid errors caused by nonlinear distortion.
Pul 1 Pos	**Pul 1 Pos** sets the location of the lefthand upward pulse. A dotted line on the display indicates the approximate position.

Pul 2 Offs	**Pul 2 Offs** sets the location of the righthand downward pulse, expressed as an offset from the lefthand upward pulse location. Use the default value, or touch the **Auto Adjust** softkey to precisely set this offset. This offset is critical for correct measurement of the signal.
Area	**Area** changes the measurement area to allow the measurement to use on Composite Test Signals, etc. For best results, use the largest value possible. Smaller areas may result in lost low-frequency accuracy and reduced frequency resolution.
Exit	**Exit** leaves the Special Position submenu and displays the GroupDelay SinX_X display.

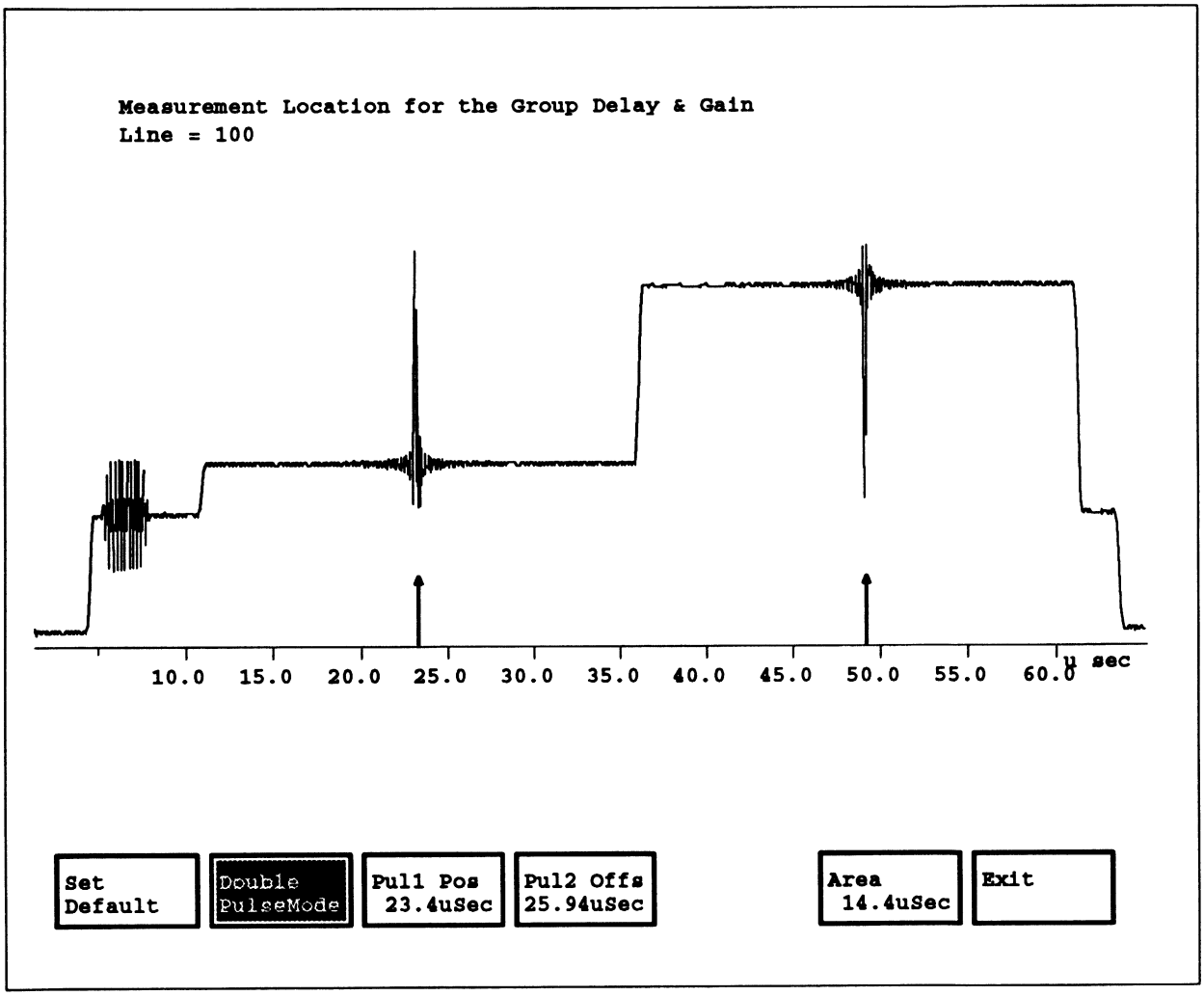

Figure 2-24. GroupDelay SinX_X special position display.

H_BLANK

H_Blank measures where horizontal blanking starts and ends within a field.

H_Blank Display

Figure 2-25 shows the H_Blank display. The zero point of the x-axis is the leading edge of sync. The y-axis consists of all the lines in the measured area of the field. The display plots the times at which each line crosses the H_Blank measurement's "slice level."

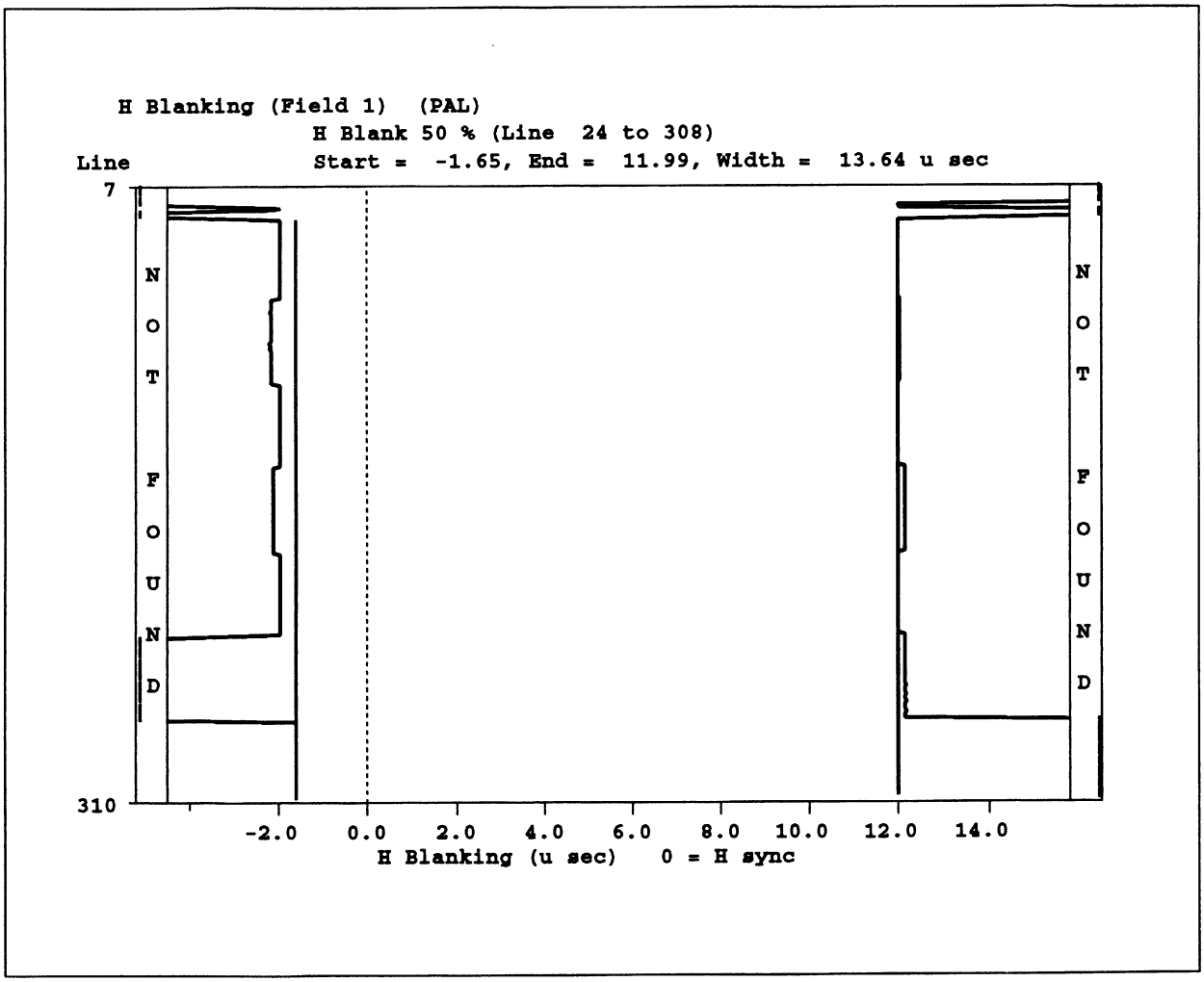

Figure 2-25. H_Blank display.

The slice level, or threshold, is the voltage that defines the start or end of the horizontal blanking interval. The left side of the display shows the time at which each line crosses the slice level voltage at the beginning of its horizontal blanking interval. The right side of the display shows the time at which each line crosses the slice level voltage to end its horizontal blanking interval. Digital readouts above the display show the minimum values for horizontal blanking (i.e., the rightmost start time and the leftmost end time) over the range of lines selected.

The H_Blank measurement can use any PAL video signal for input.

H_Blank Menu

Pressing the Menu button when the H_Blank measurement runs displays the H_Blank menu (Figure 2-26).

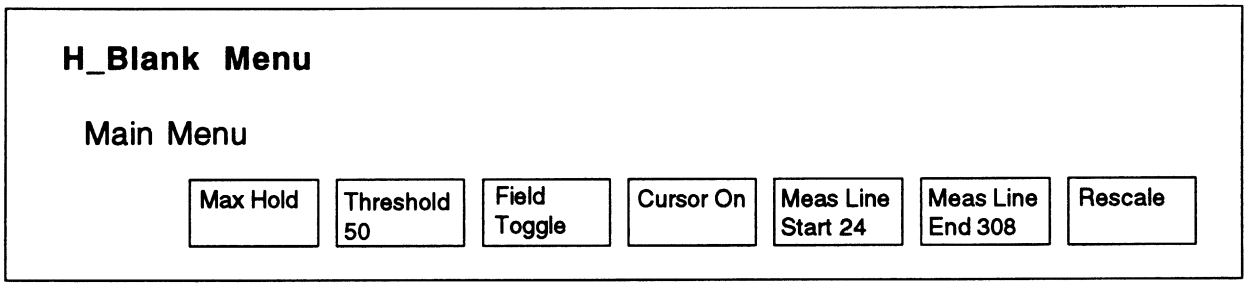

Figure 2-26. H_Blank menu tree.

MAIN MENU

Max Hold	**Max Hold** when highlighted, the measurement cursors hold the maximum unblanking positions. When de-selected, the measurement cursors move to reflect the current unblanking positions.
Threshold	**Threshold** allows you to set the blanking search level as a percentage of maximum white level by rotating the knob. Possible values range from 4 to 99%. The 100% level is computed as 7 / 3 x sync level.
Field Toggle	**Field Toggle** displays the system line in the other field from that currently displayed.
Cursor On	**Cursor On** when highlighted, the cursors show the minimum blanking interval over the range of lines being measured. On is the default.
Meas. Line Start	**Meas. Line Start** sets the measurement start line.
Meas. Line End	**Meas. Line End** sets the measurement end line.
Rescale	**Rescale** rescales the display graticule to an appropriate resolution.

H_TIMING

H_Timing makes various measurements around H_Sync.

Figure 2-27 shows the H_Timing display. The timing measurements made and displayed are: sync to blanking start, sync to blanking end, sync to burst start , burst width, sync width, burst level, sync rise time, sync fall time, and sync level.

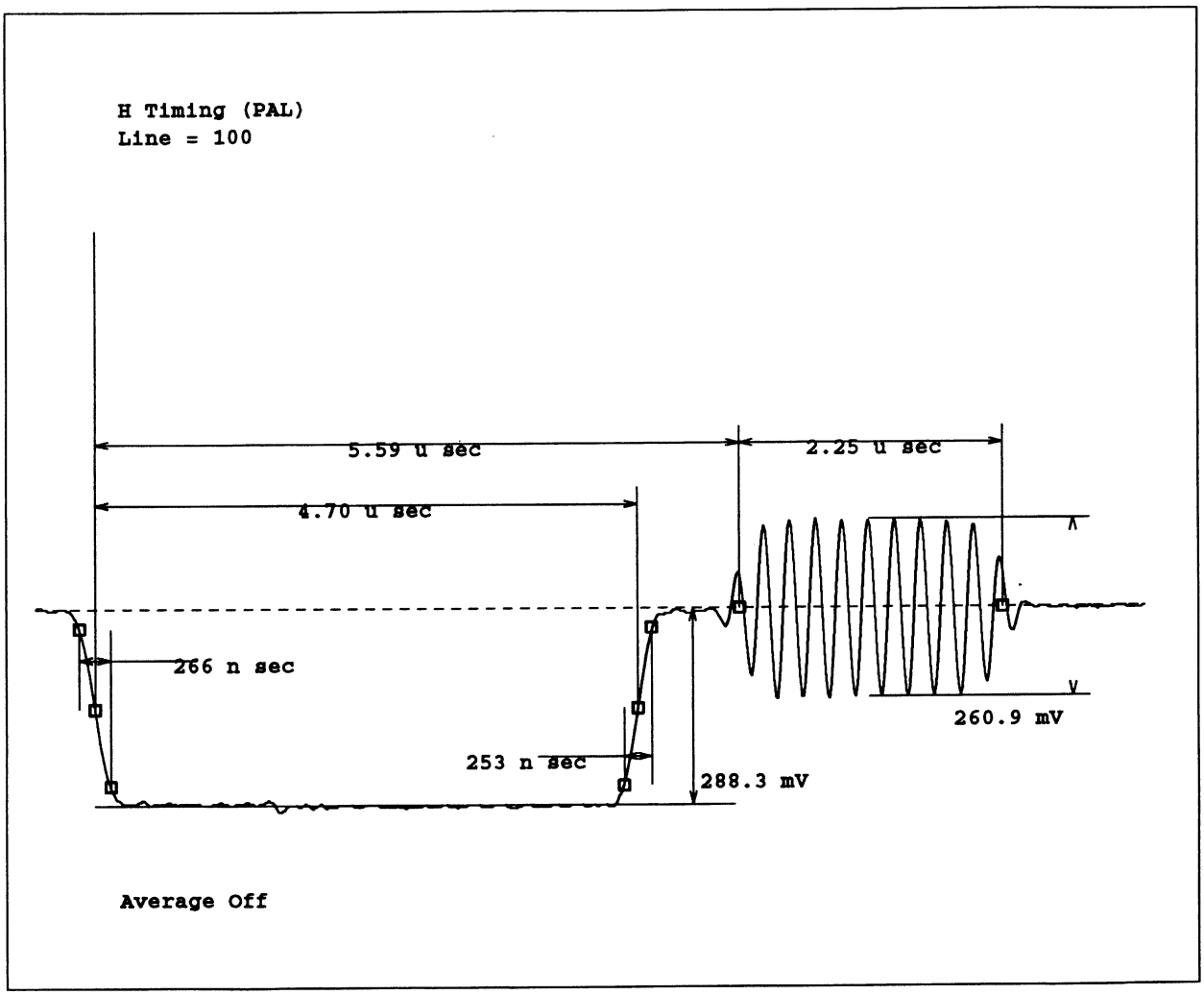

Figure 2-27. H_Timing display.

The H_Timing measurement can use any video signal for input.

You can freeze the display while running the H_Timing measurement and still use the move/expand display capabilities to adjust the waveform display as desired.

H_Timing Menu

Pressing the Menu button when the H_Timing measurement runs displays the H_Timing menu (Figure 2-28).

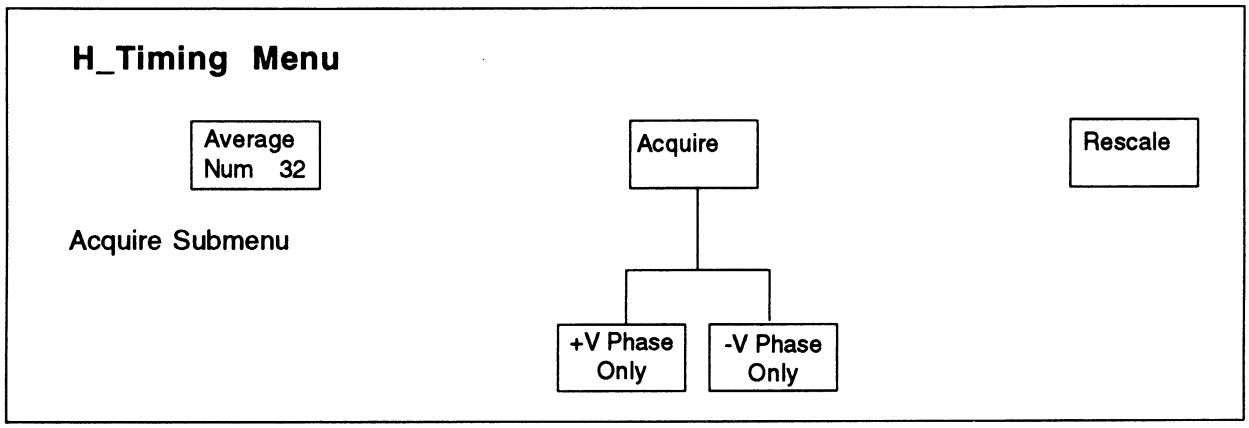

Figure 2-28. H_Timing menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Acquire	**Acquire** displays the Acquire submenu that selects whether the +V phase axis or the –V phase axis is acquired.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the H_Timing measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

ACQUIRE SUBMENU

+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**–V Phase Only** measures only the –V phase part of the signal.

ICPM

ICPM measures Incidental Carrier Phase Modulation of an RF carrier, using the quadrature output of a demodulator such as the Tek 1450.

Incidental Carrier Phase Modulation (ICPM) is a distortion that occurs in the transmitter when the phase of the modulated carrier is affected by the level of the modulating video signal. The amount by which the carrier phase is shifted is the ICPM error.

ICPM error is expressed in degrees, and is defined as follows:

ICPM = arctan(quadrature amplitude/video amplitude)

ICPM errors produce different effects, depending on the type of demodulation used to recover the baseband signal from the transmitted signal. ICPM errors appear in synchronously demodulated signals as differential phase and many other types of distortions, but the baseband signal is generally not as seriously affected when envelope detection is used. The effects of ICPM errors are therefore rarely seen in the picture in home receivers, which typically use envelope detection.

However, ICPM errors may manifest themselves as audio buzz at the home receiver. In the intercarrier sound system, the picture carrier is mixed with the FM sound carrier to form a 4.5 MHz sound IF. Audio rate phase modulation in the picture carrier can therefore be transferred into the audio system and heard as a buzzing noise.

ICPM Display

ICPM errors are measured by examining an XY plot of the VIDEO OUT versus QUADRATURE OUT outputs from a synchronous demodulator, using as input either a staircase signal of 5 or 10 steps, or a ramp. VIDEO OUT is plotted along the y axis with negative polarity (black is at the bottom, and indicates maximum transmitter output), while QUADRATURE OUT is plotted along the x axis. The origin of the system is in the horizontal center of the top of the display.

In the resulting plot, phase errors appear as a non-zero value from the QUADRATURE OUT output of the demodulator. If no ICPM errors are present, the plot appears as a succession of bright dots down the video-axis of the ICPM display output (Figure 2-29). When using a staircase test signal for the ICPM measurement, the curved lines that appear on the display are due either to transitions between successive levels of the test signal, or to the transition between the top of the staircase and the back porch. These curved lines can be ignored for purposes of this measurement.

If ICPM errors are present, phase errors will usually vary with amplitude, producing a tilted line of bright dots on the ICPM display (Figure 2-30).

inputs: video on A

Q on C

select: A.

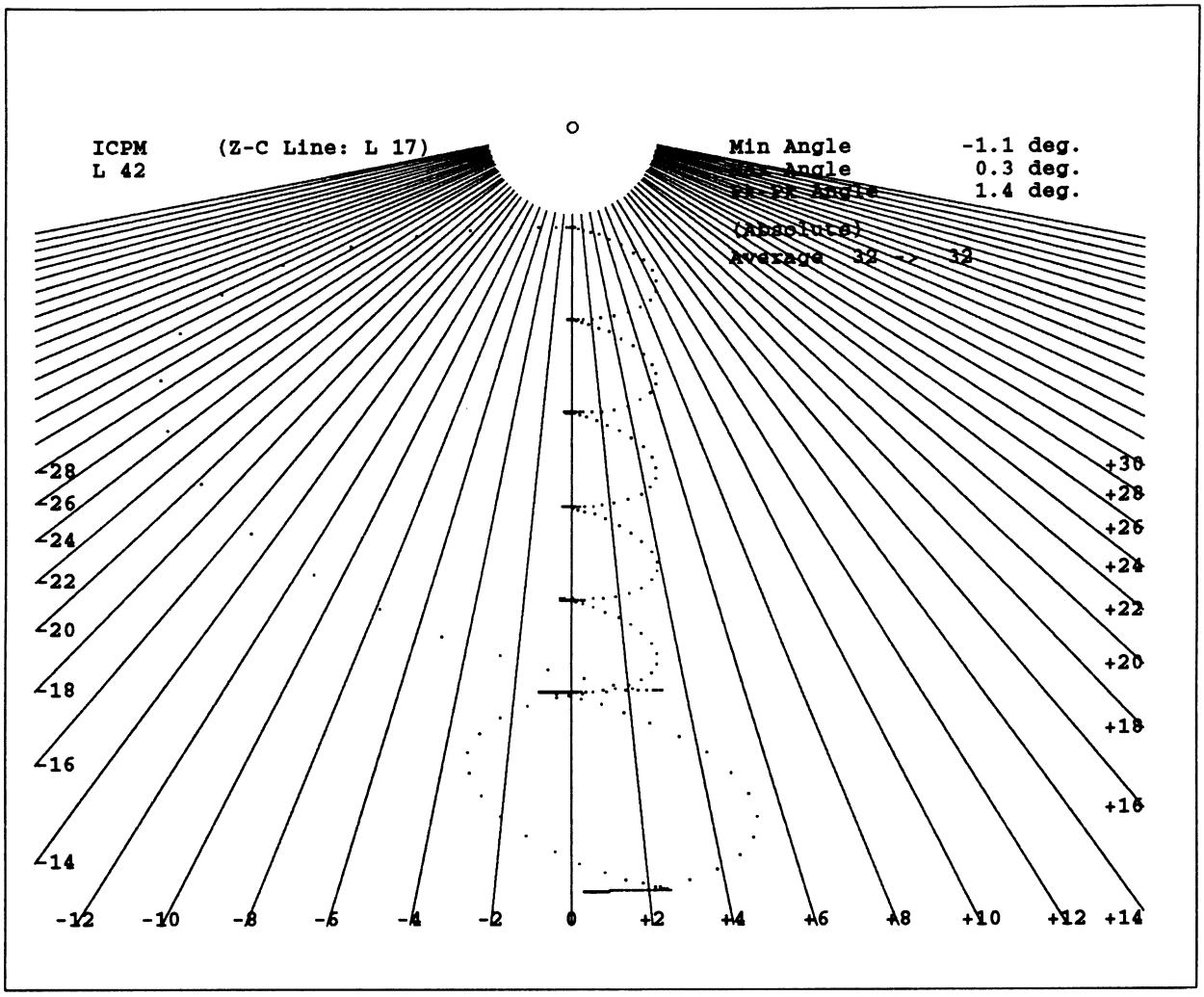

Figure 2-29. ICPM display; no ICPM errors present.

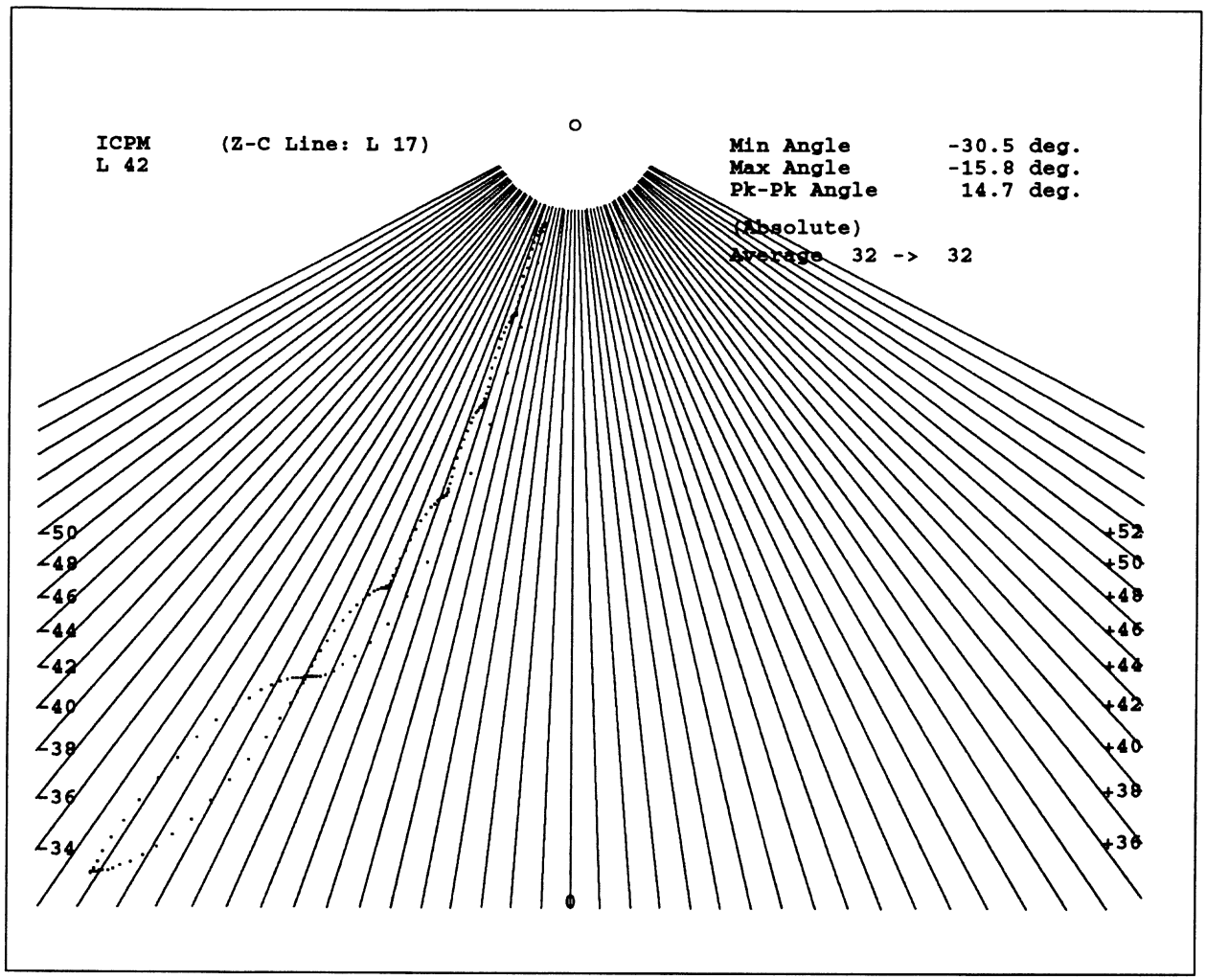

Figure 2-30. ICPM display; large ICPM error present.

ICPM errors usually indicate a problem with the transmitter, or with modulator imbalance. (It is also remotely possible that a malfunctioning demodulator can give you a problem that looks like ICPM, but isn't). Given that the demodulator is functioning correctly, however, ICPM errors generally indicate a linearity problem in the high-power stages of the transmitter.

Text on the left-hand side of the ICPM display tells you the name of the measurement (ICPM), the line on which the measurement is being made, and the percentage of the nominal carrier amplitude being used as a data exclusion threshold for the measurement (i.e., signal levels below the minimum or above the maximum percentage of the nominal carrier amplitude are excluded from the measurement).

Text on the right-hand side of the ICPM display tells you the minimum measured ICPM angle, the maximum measured ICPM angle, and the peak-to-peak measured ICPM angle (i.e., the difference between current maximum and minimum measured ICPM angles).

ICPM Menu

Pressing the Menu button when the ICPM measurement runs displays the ICPM menu (Figure 2-31).

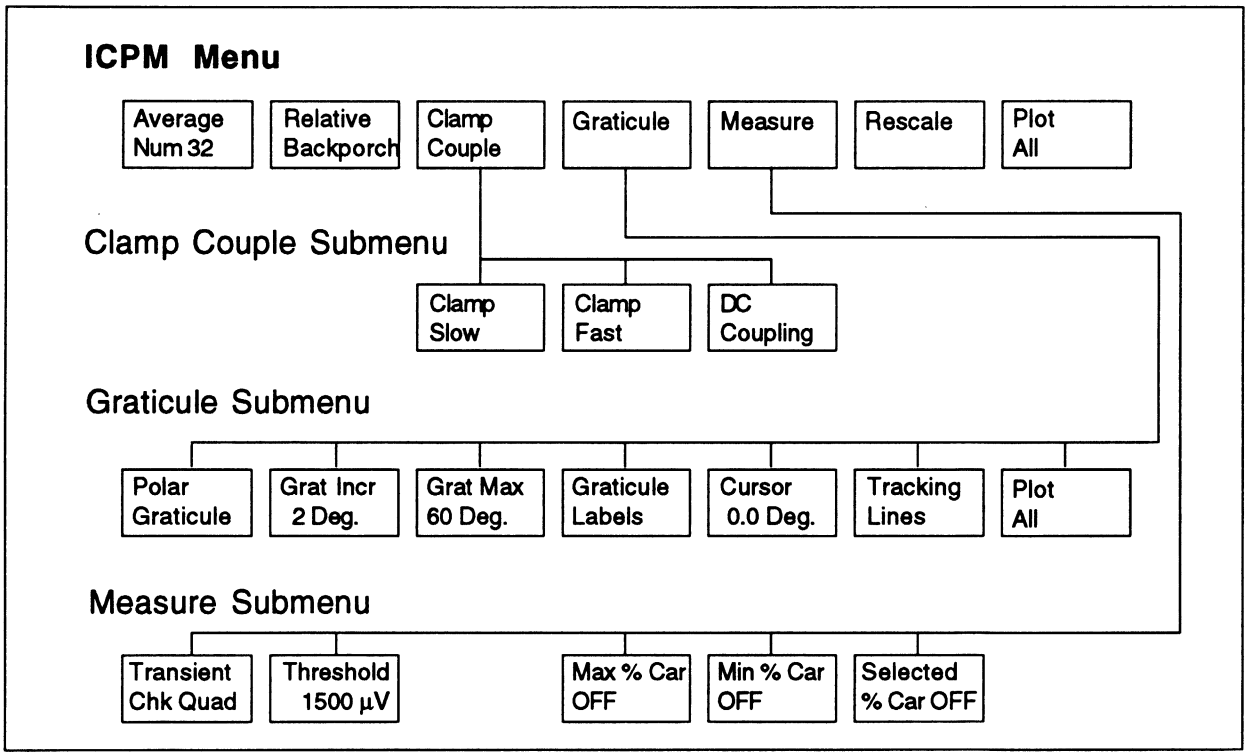

Figure 2-31. ICPM menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Relative Backporch	**Relative Backporch** when highlighted, the result angles are measured relative to the angle at burst center. In addition, displayed points are adjusted in the left-right direction (the quadrature axis) to maintain relevance with the cursor, tracking lines, and polar graticule.
Clamp Couple	**Clamp Couple** displays the Clamp Couple submenu that sets the Clamping mode used by the ICPM measurement.
Graticule	**Graticule** provides softkeys that control the displayed graticule and the maximum-angle tracking lines.
Measure	**Measure** provides softkeys that are used to determine which data points are used in the ICPM measurement.
Rescale	**Rescale** returns the reference point to the center of the screen, sets the left-right expansion for the quadrature axis to a comfortable value, and re-adjusts the top-bottom expansino for the video axis so that the sync level is at a pre-determined poitn.
Plot All	**Plot All** when highlighted, all sampled data points display. When de-selected, only points used in computing the ICPM measurement result display.

CLAMP COUPLE SUBMENU

Clamp Slow	**Clamp Slow** selects slow clamp speed. This speed allows hum effects to be visible, but is useful in coping with large DC offsets on an input signal.
Clamp Fast	**Clamp Fast** selects fast clamp speed. This speed removes DC offset, hum, and bounce effects from the signal. This is the default clamp setting for the ICPM measurement.
DC Coupling	**DC Coupling** selects DC coupling (no clamping).

GRATICULE SUBMENU

Polar Graticule	**Polar Graticule** when highlighted, displays a polar graticule on the screen and brings up the **Grat Incr**, **Grat Max**, and **Graticule Labels** softkeys.
Grat Incr 2 Deg.	**Grat Incr** adjusts the increment between individual lines of the polar graticule with the knob. Possible values range from 1 to 30 degrees. Below the 1-degree setting is "AUTO," which causes the graticule increment to be maintained at a "good" value based on the current expansion and position.
Grat Max 60 Deg.	**Grat Max** adjusts the maximum angle of displayed polar graticule lines. The maximum angle allowed is 89 degrees. Below the 1-degree setting is "AUTO," which causes the maximum graticule angle to be maintained at a "good" value based on the current expansion and position.
Graticule Labels	**Graticule Labels** when highlighted, the polar graticule has labeling numbers applied to the ends of its lines as they fit.

Cursor 0.0 Deg.	**Cursor** when highlighted, the knob moves the displayed value by tenths of a degree; a cursor that reflects this value displays on the screen.
Tracking Lines	**Tracking Lines** when highlighted, displays lines that follow the maximum and minimum ICPM angles.
Plot All	**Plot All** when highlighted, all sampled data points display. When de-selected, only points used in computing the ICPM measurement display. The softkeys under the Measure sub-menu determine which points are used in the measurement.

MEASURE SUBMENU

Transient Chk. Quad.	**Transient Chk Quad** chooses which data input is checked when discarding values around too-large point-to-point transients before measuring the maximum and minimum ICPM. Choices are the quadrature or the video input.
Threshold 1500 uV	**Threshold** sets the threshold (in microVolts) for data point exclusion from the ICPM measurement. When two consecutive sample points are not within this voltage of each other, several points around them are discarded.
Max % Car OFF	**Max % Car** sets the highest percent-of-carrier used in the ICPM measurement. When highlighted, any video input sample values above this percentage are discarded. When there is no maximum exclusion value, this key reads OFF.
Min % Car OFF	**Min % Car** sets the lowest percent-of-carrier used in the ICPM measurement. When highlighted, any video input sample values below this percentage are discarded. When there is no minimum exclusion value, this key reads OFF.
Selected % Car OFF	**Selected % Car** when highlighted, the currently highlighted **Min % Car** or **Max % Car** softkey is set to OFF, and the appropriate edge-value exclusion is removed.

JITTER

Jitter measures variation in horizontal sync timing over a single frame.

Figure 2-32 shows the Jitter display. Each line of the field is plotted along the y-axis, while time is plotted along the x-axis. The zero point of the x-axis is defined by the average position of the leading edge of sync over many frames for the range of lines being measured. The display plots the variation from this zero point for the leading edge of sync of each line in the measurement. A digital readout above the display shows the maximum value of jitter for the lines being measured.

The Jitter measurement can use any video signal as input.

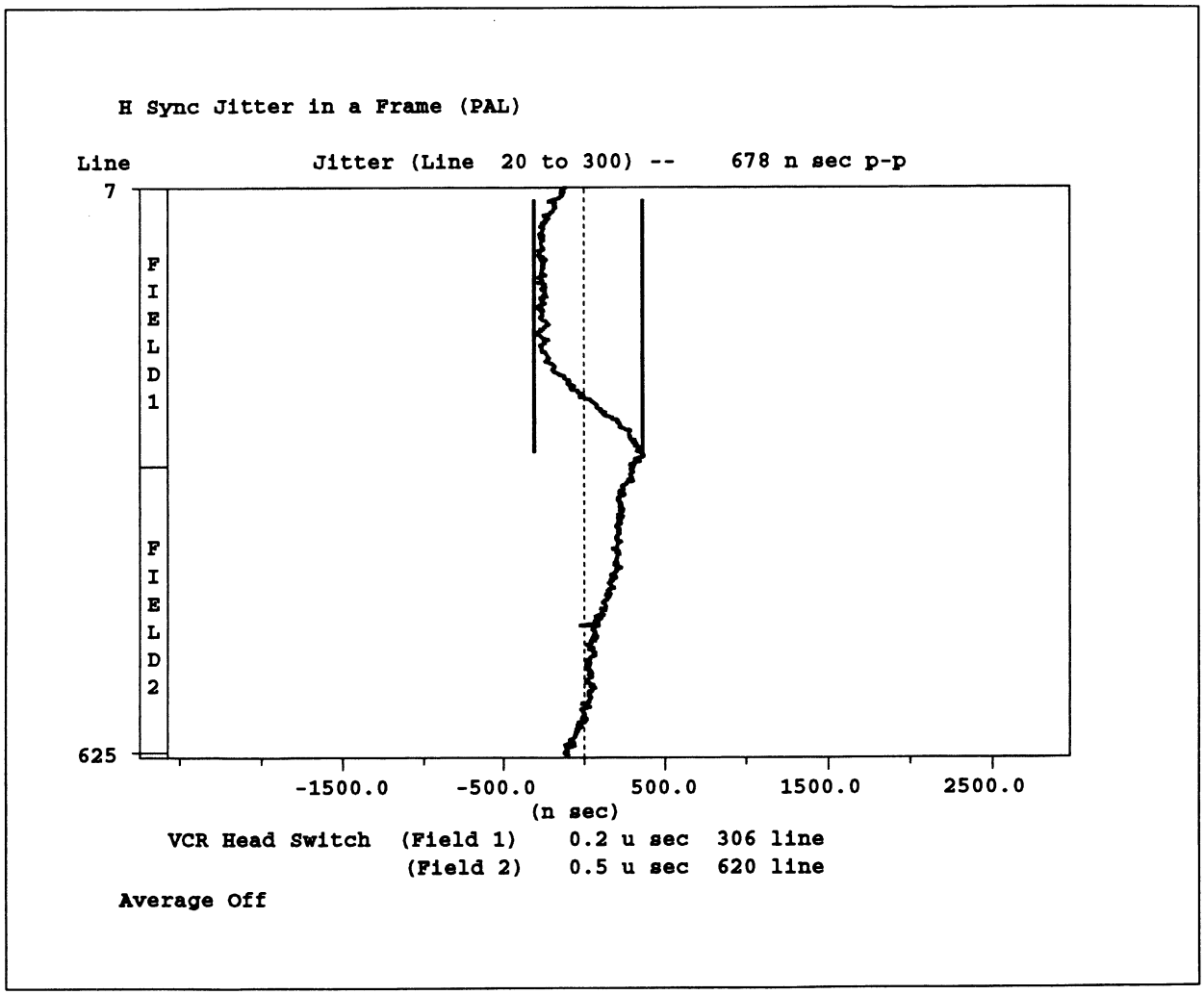

Figure 2-32. Jitter display.

Jitter Menu

Pressing the Menu button when the Jitter measurement runs displays the Jitter menu (Figure 2-33).

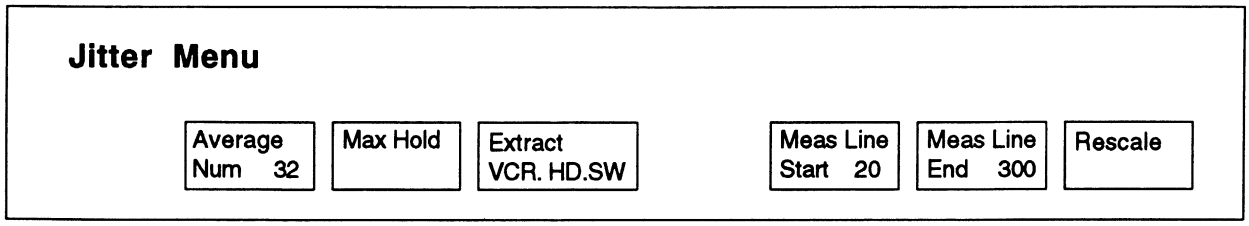

Figure 2-33. Jitter menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Max Hold	**Max Hold** when highlighted, the display's measurement cursors hold the positions of maximum jitter.
Extract VCR.HD.SW	**Extract VCR.HD.SW** searches the bottom of the picture area for horizontal timing errors exceeding 100 ns. This position is assumed to be the head switching position for a VCR. The error thus found is extracted from the Jitter display, and the resulting values and locations display.
Meas. Line Start	**Meas. Line Start** sets the measurement start line.
Meas. Line End	**Meas. Line End** sets the measurement end line.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Jitter measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

JITTER LONG_TIME

Jitter Long_Time measures variations in frame period timing.

Figure 2-34 shows the Jitter Long_Time spectrum display, plotting the variation in frame period timing (in dB, where 0 dB = 1 H) on the y-axis and frequency (in Hz) on the x-axis.

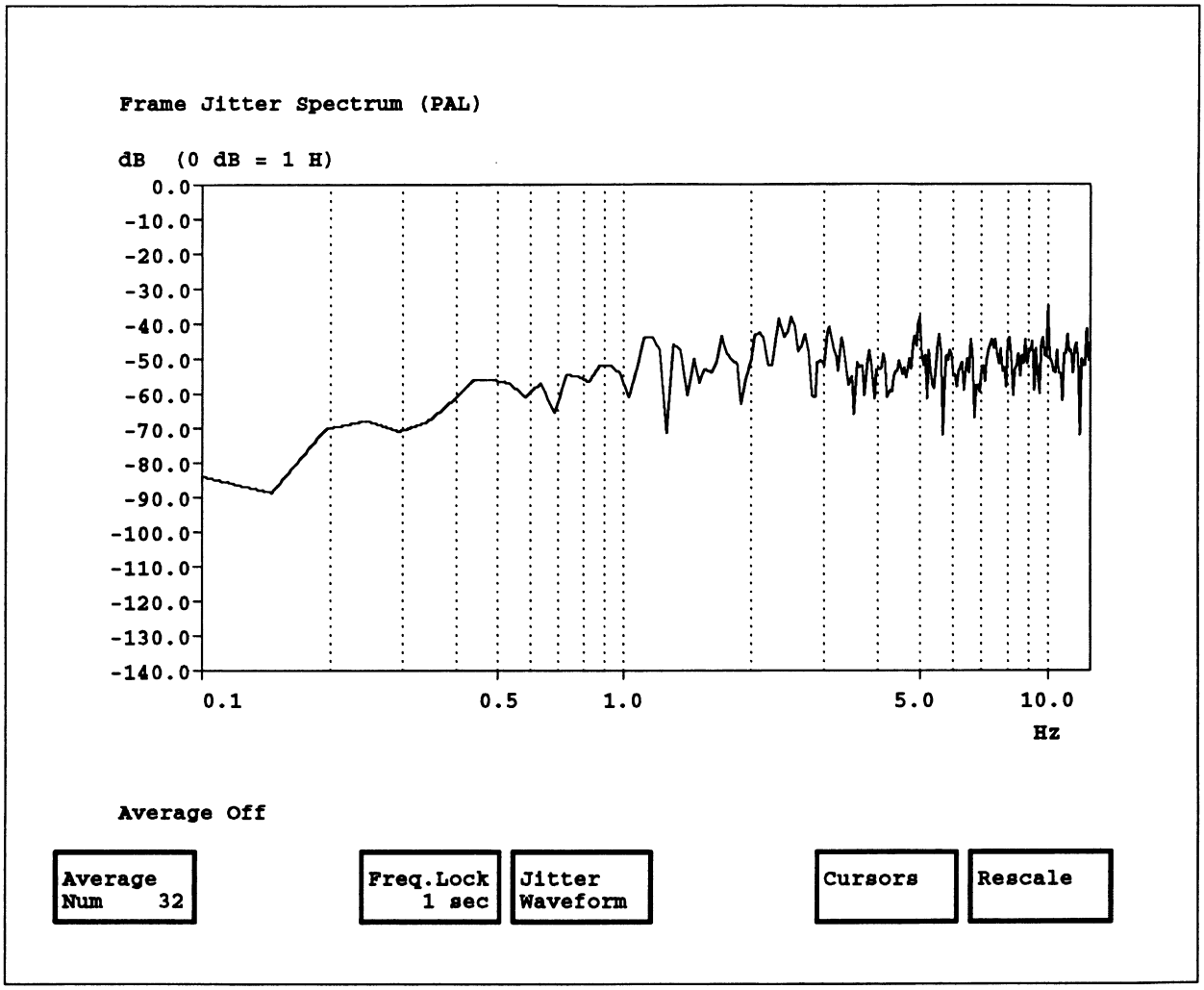

Figure 2-34. Jitter Long_Time spectrum display.

Figure 2-35 shows the Jitter Long_Time waveform display, plotting frame period jitter (in µs or ns, depending on the scale of jitter) on the y-axis and time (in seconds) on the x-axis.

The Jitter Long_Time measurement can use any video signal as input.

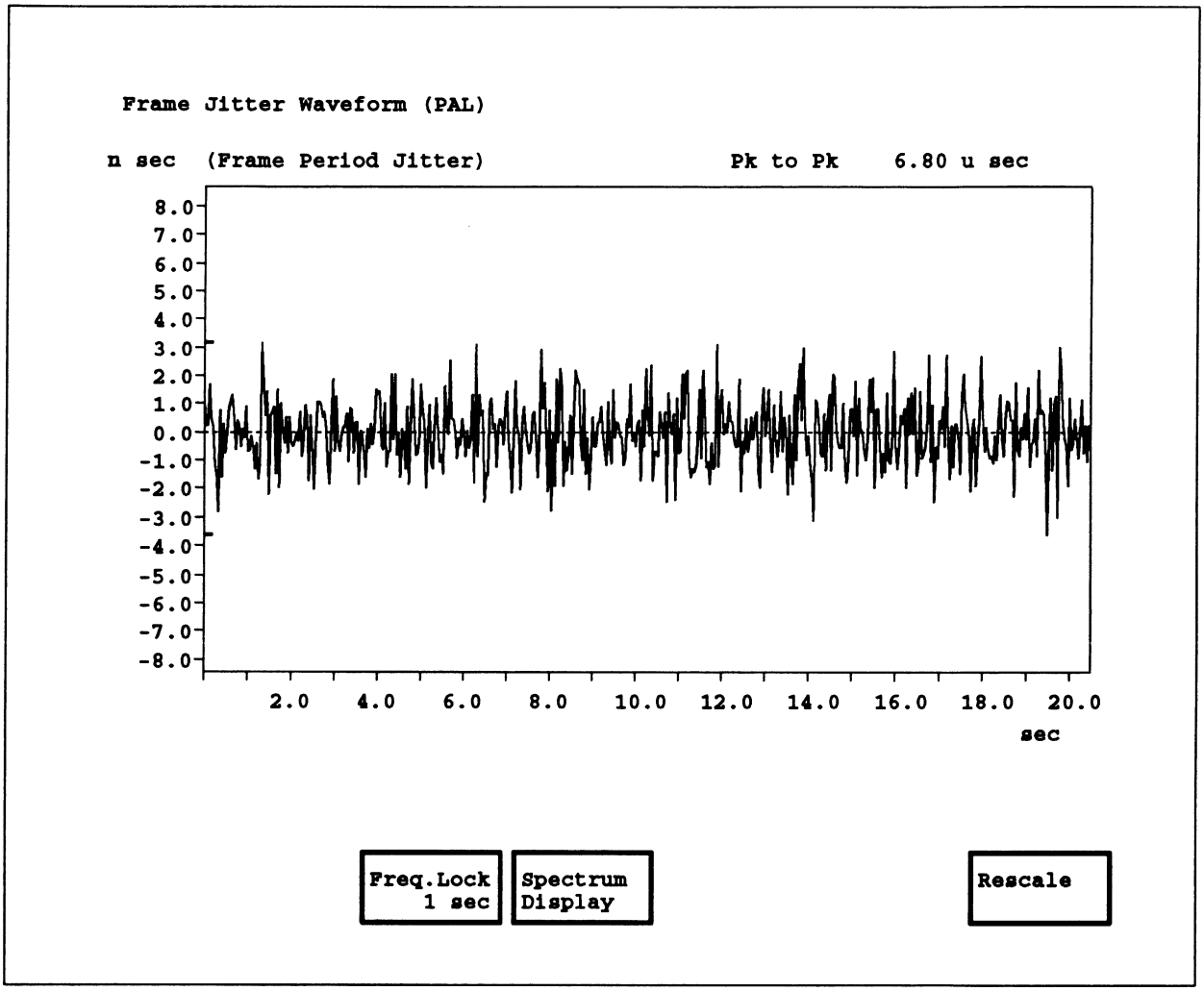

Figure 2-35. Jitter Long_Time waveform display.

Jitter Long_Time Menu

Pressing the Menu button when the Jitter Long_Time measurement runs displays the Jitter Long_Time menu (Figure 2-36).

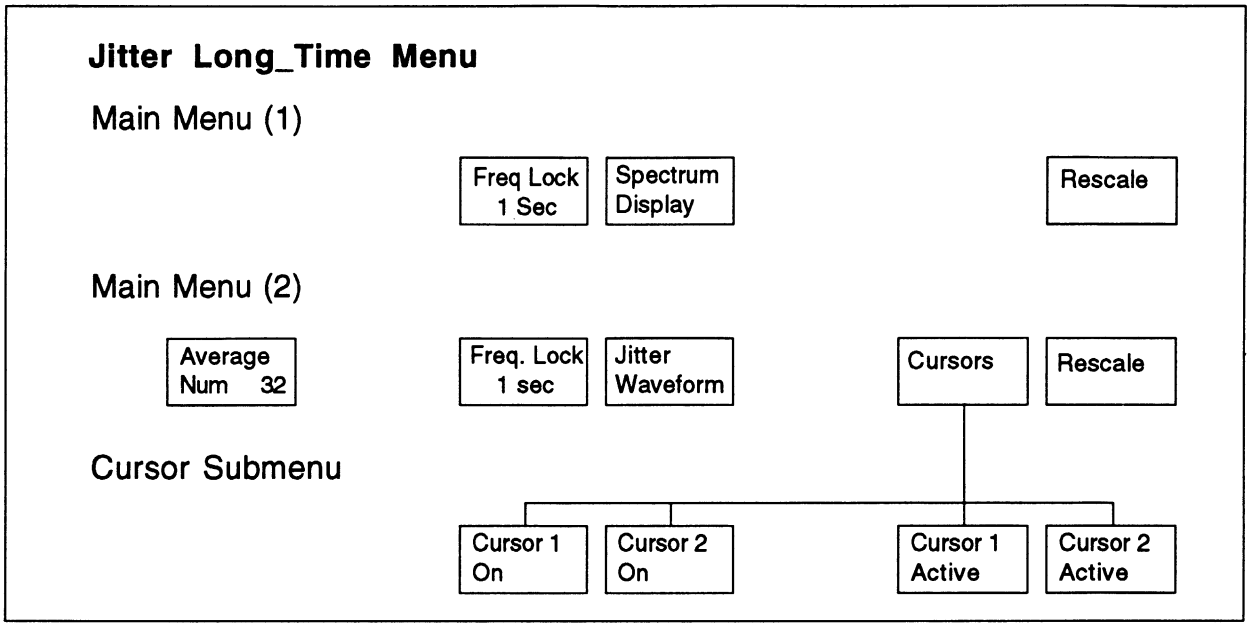

Figure 2-36. Jitter Long_Time menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Freq. Lock	**Freq. Lock** sets the time constant of the locking loop.
Spectrum Display	**Spectrum Display** shows the spectrum of the jitter waveform, using an FFT with a Hanning window.
Jitter Waveform	**Jitter Waveform** displays the "rolled" jitter waveform.
Cursors	**Cursors** provides softkeys to display and activate the two cursors. Readouts for the cursors give the value in decibels (peak-to-peak) at the frequency locations of the cursors.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Jitter Long_Time measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

CURSORS MENU

Cursor 1/2 On	**Cursor 1/2 On** displays Cursor 1 or 2, as appropriate. The cursor appears in the position it was in the last time it was active.
Cursor 1/2 Active	**Cursor 1/2 Active** enables the knob to move Cursor 1 or 2, as appropriate.

K_FACTOR

K_Factor measures K-2T, K-PB, and Pulse-to-Bar Ratio.

Figure 2-37 shows a typical K_Factor measurement display. The display shows the signal superimposed on the K-Factor graticule. Digital readouts also show the measured values of K-2T, K-PB, Pulse-to-Bar ratio, and HAD.

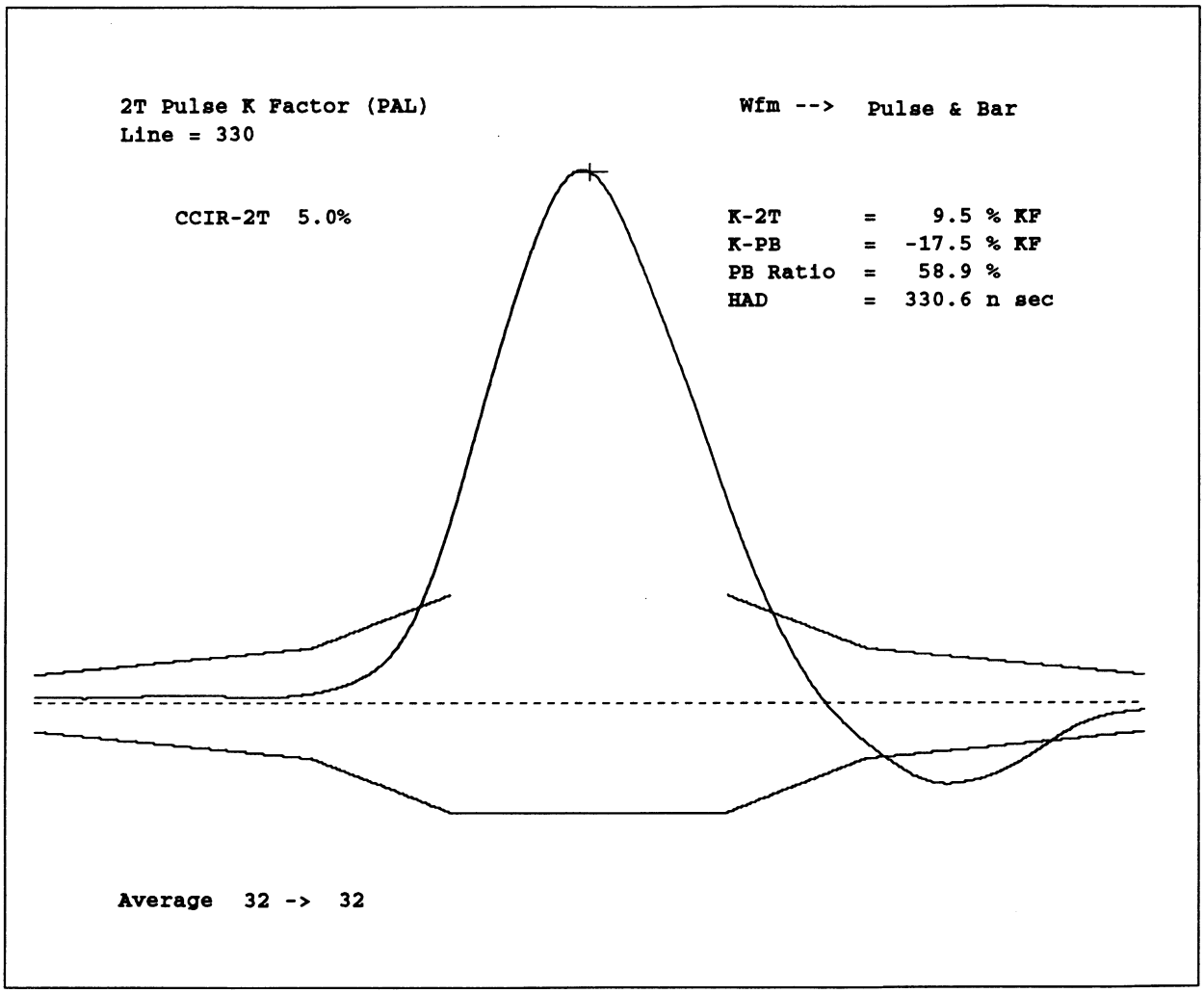

Figure 2-37. K-Factor display.

K_Factor Menu

Pressing the Menu button when the K_Factor measurement runs displays the K_Factor menu (Figure 2-38).

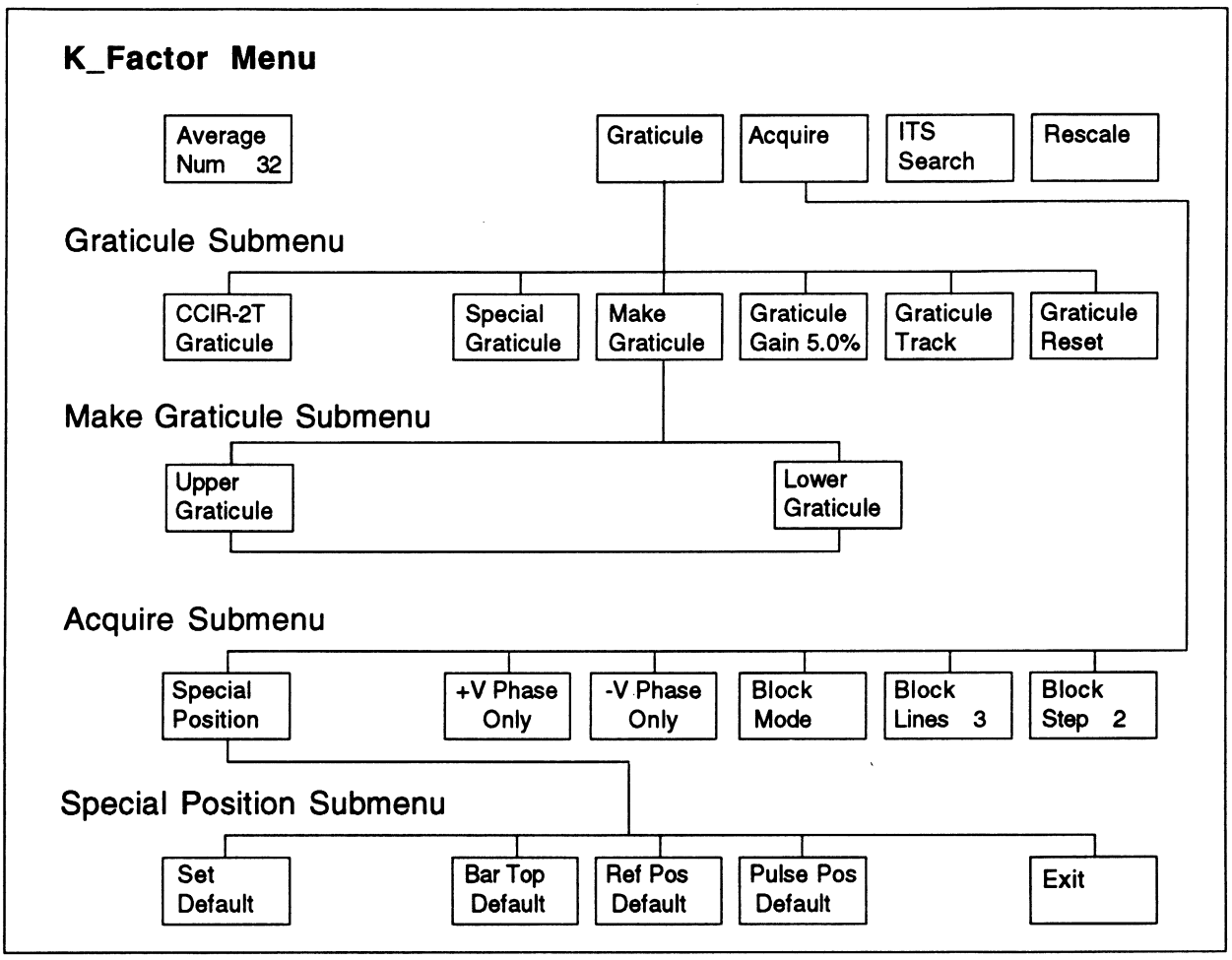

Figure 2-38. K-Factor menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Graticule	**Graticule** provides softkeys to control the graticule gain and tracking of the current graticule, and to change from a standard graticule to a user-created graticule.
Acquire	**Acquire** displays a submenu of softkeys that control how the signal is acquired for the K_Factor measurement.
ITS Search	**ITS Search** searches the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the screen.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the K_Factor measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

GRATICULE SUBMENU

Graticle Change	**Graticule Change** provides softkeys to select the current graticule, from either the standard graticule or a user-definable special graticule.
Graticule Gain	**Graticule Gain** turns on the graticule variable gain mode. The range is 0.1% to 20.0%, with a resolution of 0.1%. The gain can be set by rotating the knob. The default gain is 5.0%.
Graticule Track	**Graticule Track** turns on graticule tracking mode. When graticule tracking is on, the size of the graticule tracks the actual waveform.
Graticule Reset	**Graticule Reset** turns off graticule tracking and resets the graticule gain to 5.0%.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the K_Factor measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

GRATICULE CHANGE SUBMENU

Make Graticule	**Make Graticule** displays the Make Graticule submenu which defines the upper and lower graticules of the special graticule.
CCIR-2T Graticule	**CCIR-2T Graticule** selects the standard CCIR graticule, using the current values of graticule gain and graticule tracking.
Special Graticule	**Special Graticule** selects the special (user-defined) graticule for K_Factor measurements.

MAKE GRATICULE SUBMENU

Upper Region 1	**Upper Region 1** selects the region to define in the upper graticule of the special graticule.

Lower Region 1	**Lower Region 1** selects the region to define in the lower graticule of the special graticule.

UPPER REGION/LOWER REGION SUBMENU

Start Time	**Start Time** selects the start time from the zero position in the center of the pulse.
Variable A-E	**Variable A/B/C/D/E** selects the A, B, C, D, or E value from the formula: grat = A * exp(B * (T^C))*(T^D) + E. D is typically 1.0 E is a constant that moves the graticule vertically.
Prev Menu	**Prev Menu** moves back one menu level to the softkeys that select the region to define in the special graticule.

ACQUIRE SUBMENU

Special Position	**Special Position** sets the locations on the waveform where the measurement is made. Figure 2-39 shows the K-Factor special position display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Set Default	**Set Default** resets each K_Factor measurement location to the default value given in the Measurement Locations file. If any other softkey is highlighted, only that measurement location is reset.
Bar Pos. Default	**Bar Pos. Default** allows you to choose the bar location in the signal by rotating the knob. The VM700A finds the exact center, but this location can be reset if desired by rotating the knob.
Ref. Pos. Default	**Ref. Pos. Default** allows you to choose the reference location of the blanking level in the signal by rotating the knob.
Pulse Pos. Default	**Pulse Pos. Default** displays the pulse position cursor, which can be moved by rotating the knob. The VM700A finds the exact center of the pulse, but this location can be reset if desired by rotating the knob.
Exit	**Exit** leaves the Special Position display and returns to the main K_Factor measurement display.

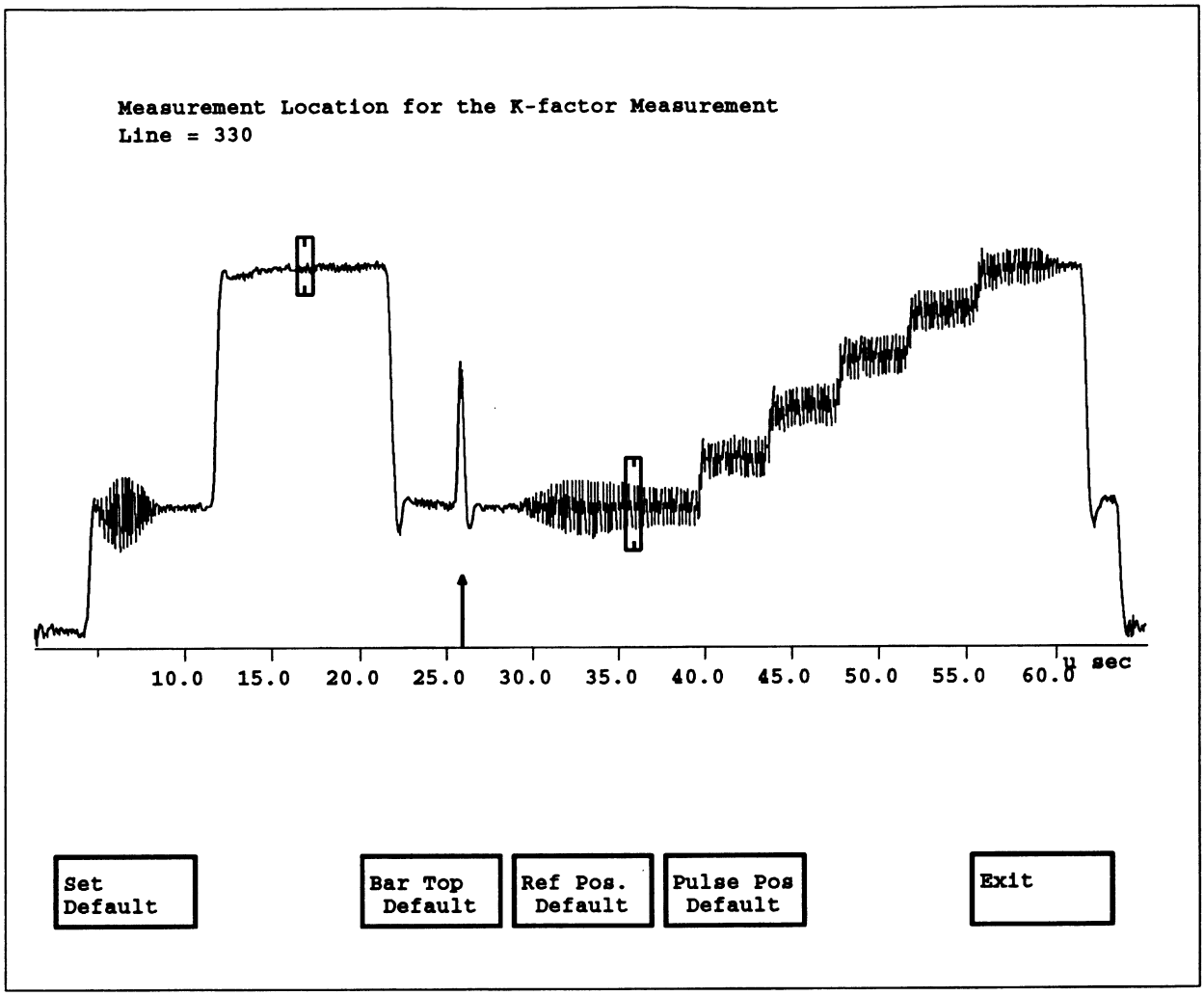

Figure 2-39. K-Factor special position display.

LEVEL METER

Level meter measures the amplitude difference between two points on a television signal and displays the result in an easy-to-read bar graph. Examples of levels that may be monitored may be the sync amplitude, peak-to-peak amplitude, etc.

Level Meter Display

Figure 2-40 shows the typical Level Meter display monitoring the peak-to-peak amplitude of a PAL color bar waveform. You can set the measurement for delta between two points in mV, delta between two points in percent referenced to a value , or absolute between one point and zero (ground) in either mV or percent. The Max and Min points of the measurement window and the reference pointer for the display are easy to set up using the menu choices under the **Display Limits** softkey, and the measurement points on a waveform are quickly selectable using the menu choices under the **Measure Position** softkey.

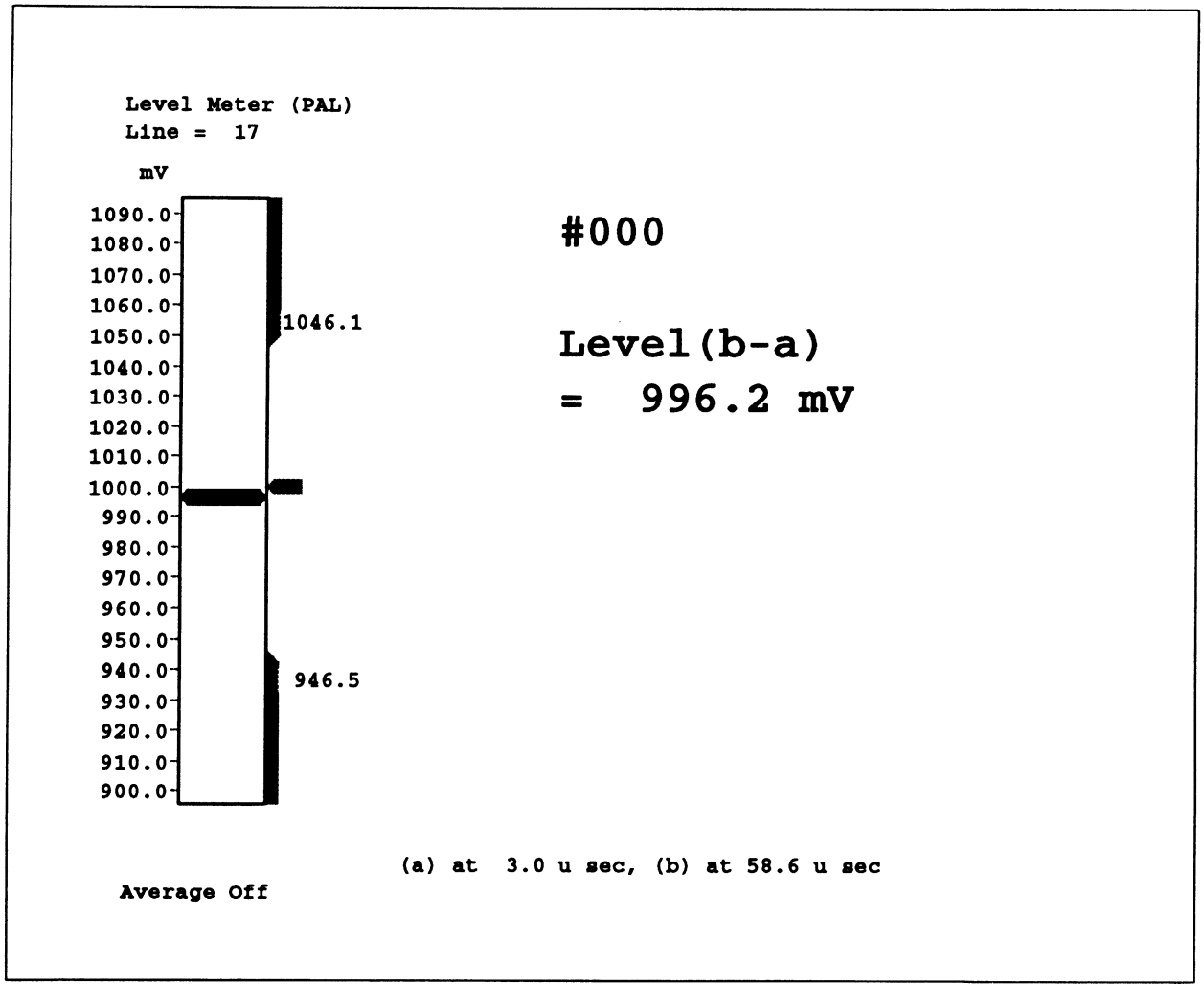

Figure 2-40. Level Meter display.

Level Meter Menu

Pressing the Menu button with the Level Meter running displays the Level Meter menu (Figure 2-41). As shown in the menu, several of the menu selections bring up additional menus to define the operation of the Level Meter.

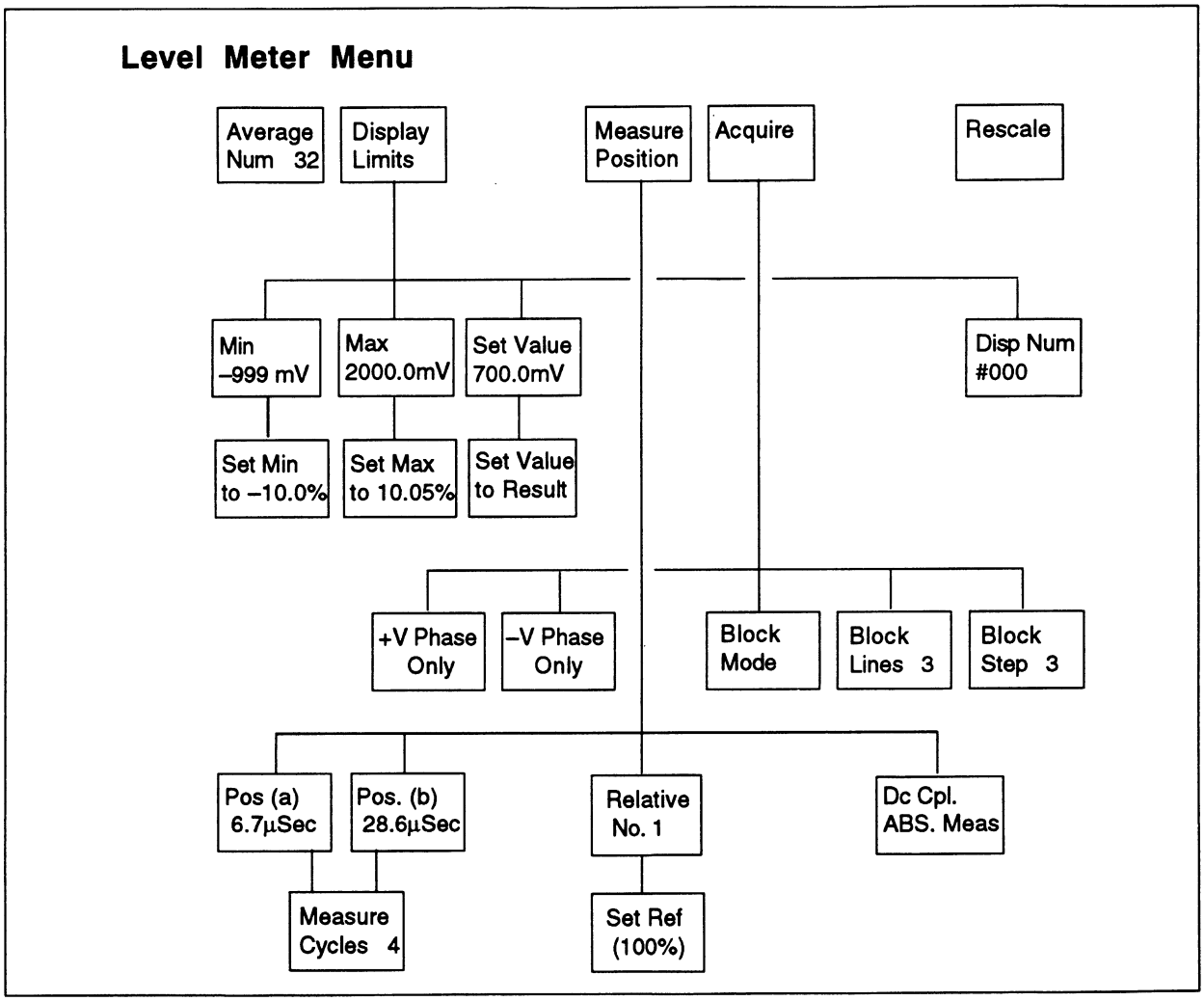

Figure 2-41. Level Meter menu tree.

LEVEL METER MENU

Average Num

Average Num nn specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the control knob until the desired weighting factor appears, then touch the **Average Num** softkey again. The effects of increasing the number used for averaging is that more time is required to arrive at a final value, but the readings become more stable as any noise variations of signal level are averaged out.

Display Limits

Display Limits displays a menu for setting the Level Meter reference limits seen in the Level Meter display. Provision are available for setting the minimum and maximum amplitude values for the measurement window, and for setting a measurement reference pointer. The Expand and Move feature works on the vertical axis to permit a Level Meter display to be set up to monitor a level measurement of a video signal over a wide range of resolution and amplitudes.

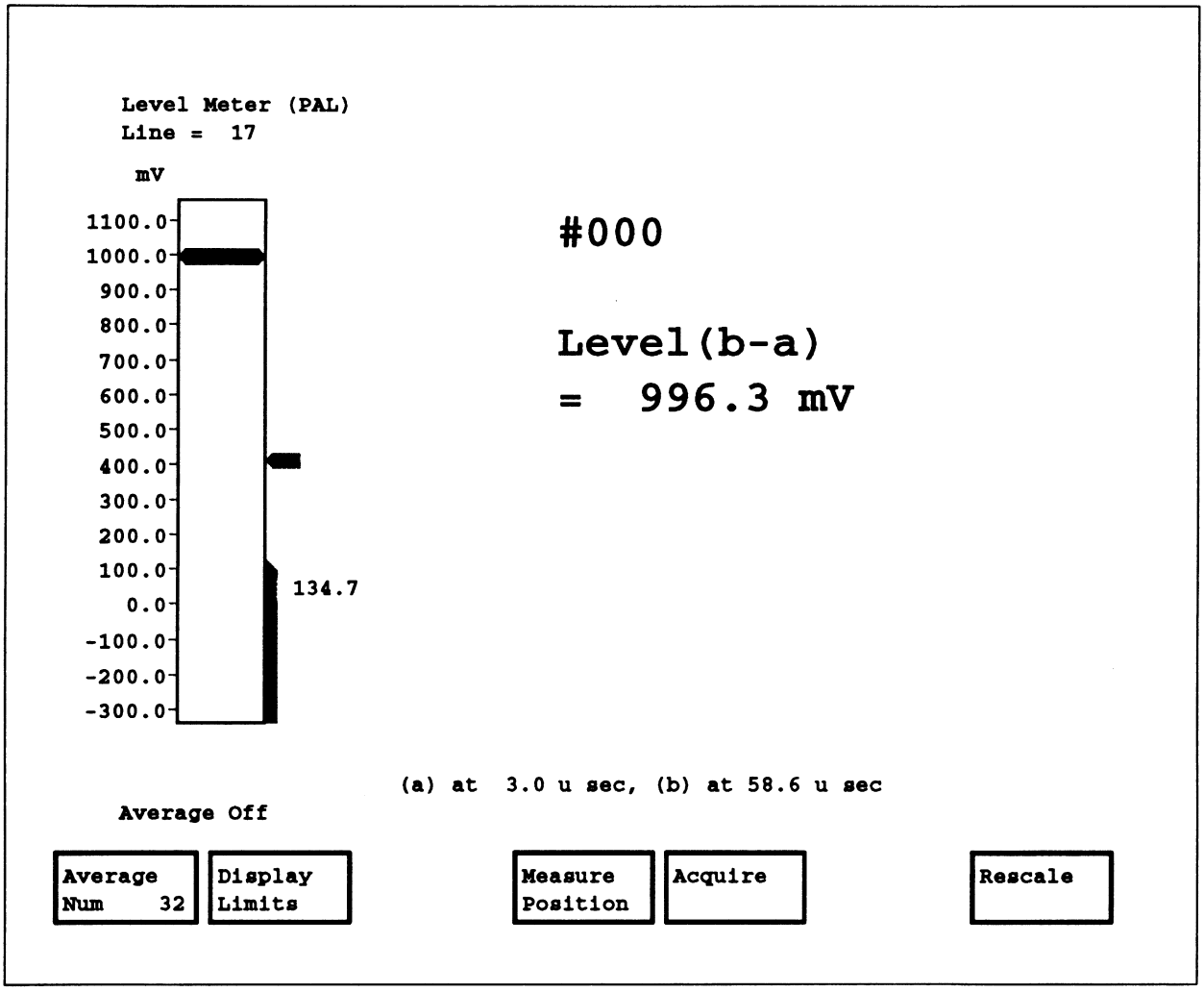

Figure 2-42. Display Limits menu showing undefined measurement points.

Min

Min selects the minimum display limit marker for adjustment. With the **Min** softkey selected, rotating the control knob sets the minimum display window marker to the number displayed in the softkey box. It cannot be set to a higher amplitude than the reference pointer level. The minimum limit is either –999 mV or –200%.

With the **Min** softkey selected another menu choice is added: **Set Min to –nn%**. This softkey provides a means to quickly set up a minimum percentage to monitor after the measurement points have been selected. See Setting Up a New Measurement Window for an example of how this softkey may be used. Also, the percentage setting of the softkey may be set between 0 and –10% by rotating the control knob while holding your finger on the **Set Min to –nn%** menu choice. The default is –10%.

Max

Max selects the maximum display limit marker for adjustment. With the **Max** softkey selected, rotating the control knob sets the maximum display window marker to the number displayed in the softkey box. It cannot be set to a lower amplitude than the reference pointer level. The maximum limit is either 2000 mV or 200%.

With the **Max** softkey selected another menu choice is added: **Set Max to nn%**. This softkey provides a means to quickly set up a minimum percentage to monitor after the measurement points have have been selected. See Setting Up a New Measurement Window for an example of how this softkey may be used. Also, the percentage setting of the softkey may be set between 0 and 10% by rotating the control knob while holding your finger on the **Set Max to nn%** menu choice. The default is 10%.

Set Value

Set Value selects the reference pointer for adjustment. With the **Set Value** softkey selected, rotating the control knob sets the reference pointer to the value displayed in the softkey box. The reference pointer may be positioned at any location within the measurement range, and may be used to mark the nominal measurement point for a quick visual reference of value changes in the amplitude being monitored. The reference pointer pushes the maximum and minimum display limit markers if the reference pointer setting is moved past the set display limits.

With the **Set Value** softkey selected, another menu choice is added: **Set Value to Result**. After the measurement points have been selected using the choices under the **Measure Position** softkey, using the **Set Value to Result** softkey quickly aligns the reference pointer to the measured value. This is near or at the value that will be monitored if the cursors positions have be adjusted to the correct points in the waveform. See *Setting Up a New Measurement Window* for an example of how this softkey may be used.

Disp. Num #000

Disp.Num #000 This number is user-selectable to provide an identification number for a screencopy of the display.

Measure Position

Measure Position displays a menu and waveform for positioning the measurement cursors. The amplitude measurement may be set for the cursor difference (b-a) in mV, cursor difference (b-a/reference) in percent relative to a reference, or cursor position with respect to zero. The number of cycles over which the measurement is made is also selectable for each cursor. The **Measure Cycles n** display indicates the current selection for the active cursor. The measure position display is illustrated in Figure 2-43 showing the cursors positioned to measure the nominal peak-to-peak amplitude of the PAL color bar test signal. The active cursor has a vertical marker attached.

Pos. (a) nn µSec selects cursor "a" for time positioning in the waveform display over a range of 0.7 to 64.2 µsec. This choice is not present when ASB. Meas. is active. The number displayed is the time position in waveform from the leading edge of the horizontal sync. If cursor "a" is at a higher amplitude than cursor "b," the sign of the resulting measurement is negative (–a being of a greater magnitude that b).

Pos. (b) nn µSec selects cursor "b" for time positioning in the waveform display over a range of 0.7 to 64.2 µsec. The number displayed is the time position in waveform from the leading edge of the horizontal sync. If cursor "b" is positioned before cursor "a" the waveform, the sign of the measurement readout reverses.

Measure Cycles n selects the number, from 1 to 50, of sub-carrier frequency cycles over which the measurement is made. The default is 3 cycles. This setting is associated with the selected cursor, and the horizontal size of the cursor box changes as the number in the softkey box is changed to indicate the measurement area on the displayed waveform.

Relative No. 1 turns on the relative measurement units of percentage and displays the **Set Ref (100%)** softkey that used to set the 100% reference. Position the "a" and "b" cursors to the minimum and maximum points that define the 100% amplitude to use as the reference amplitude, then touch the **Set Ref (100%)** softkey. The amplitude readout will then reflect the percentage difference between the position of cursor "b" and the 100% reference value.

In Figure 2-43, the reference is set to 714 mV as the 100% reference, and the measurement is based on the difference between the vertical position of the cursor and zero as a result of also selecting **DC Cpl. ABS. Meas.**

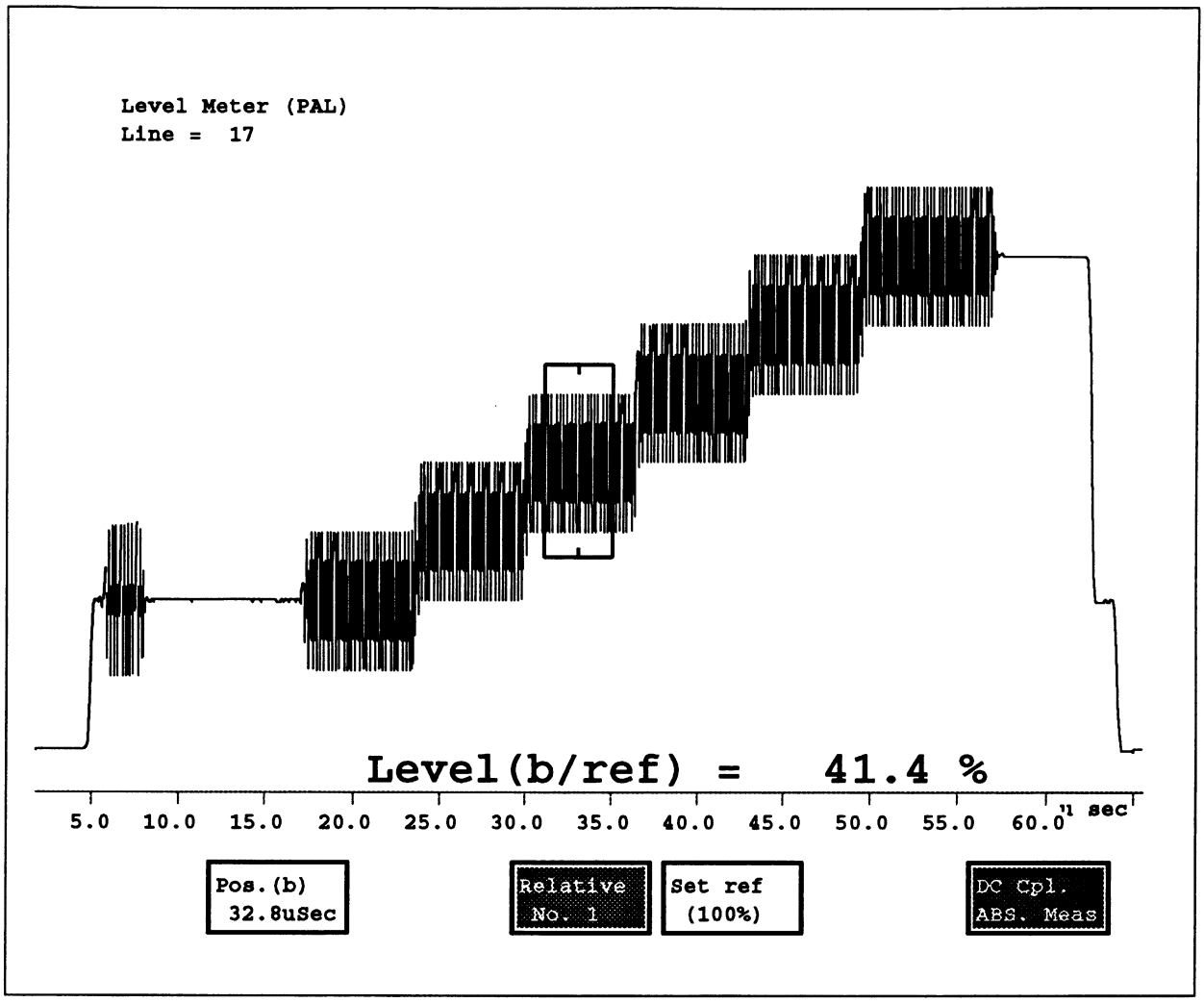

Figure 2-43. Display Position display showing absolute measurement referenced to 714 mV as 1005.

DC Cpl. ABS. Meas switches to dc coupling of the input signal and produces a measurement value based on the vertical position of cursor b with respect to zero volts (ground) as seen in Figure 2-43. The Level Meter display that results from setting up for a referenced and absolute amplitude is seen in Figure 2-44.

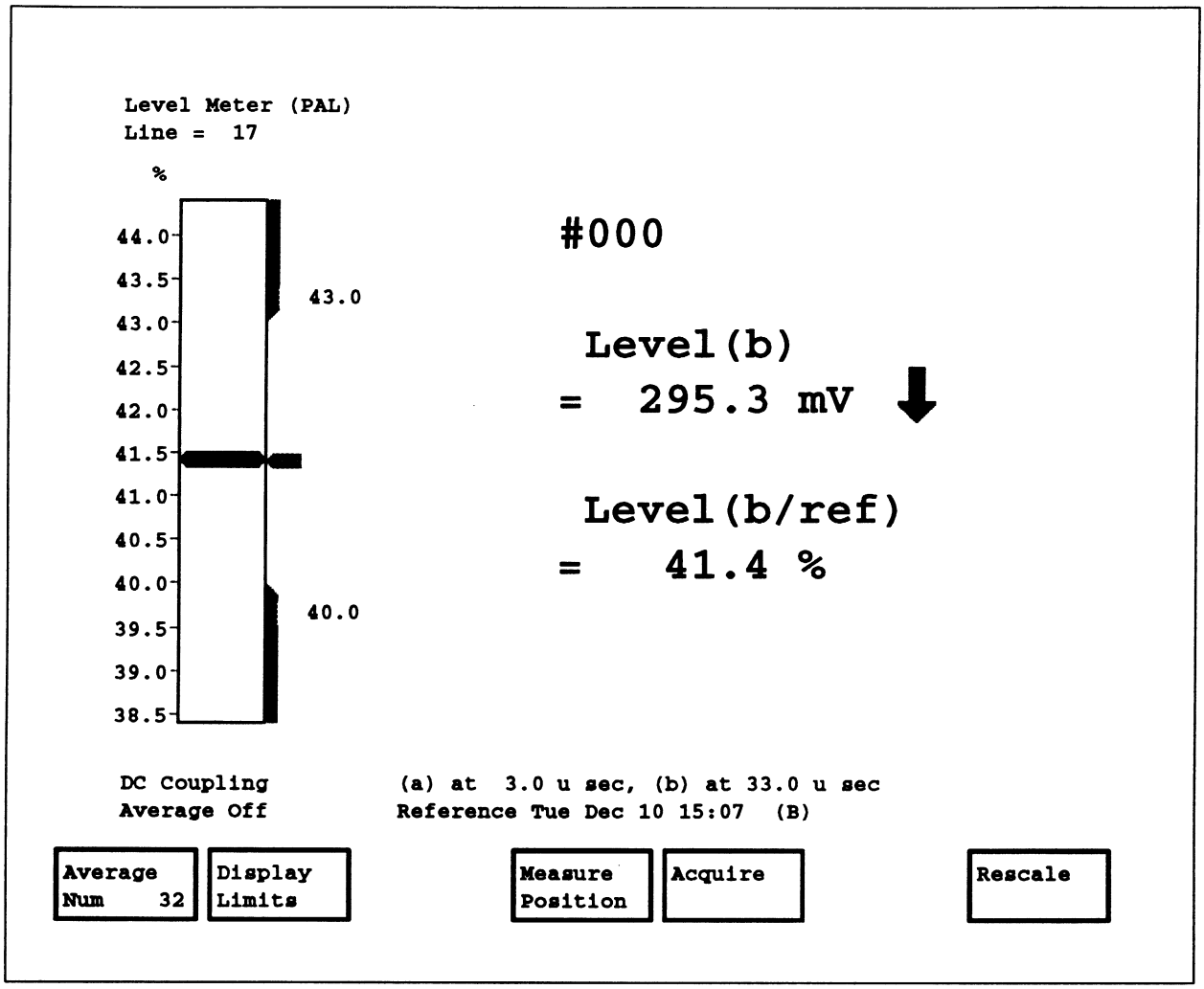

Figure 2-44. Level Meter display as a result of the setup shown in Figure 2-70.

Acquire

Acquire displays a menu used to select block acquisition mode and to control the number of lines in the block acquired and the number of lines to step in a block.

Block Mode turns Block Mode acquisition on and off.When block acquisition is used, all the waveforms within a defined block are averaged to make the measurement. It is left to the user to ensure that all the waveforms within the selected block are the same. If only a single line is needed for monitoring the measurement you want to make, Block Mode should be turned off to avoid mixing waveform types in the measurement. When Block Mode is on, a readout line near the top of the display gives the start, step, and stop lines for the acquired block.

Block Lines n determines the number of lines in a Block Mode acquisition from 2 to 32 lines. The default number is 3.

Block Step n determines the size of the step for a Block Mode acquisition from 1 to 313 lines. The default number is 2.

+V Phase Only measures only the +V phase part of the PAL video signal.

–V Phase Only measures only the –V phase part of the PAL video signal.

Rescale

Rescale readjusts the vertical scale position to place the measured value within the Level Meter viewing area. After adjusting the Max and Min display limits to new values, using Rescale will adjust the display for the optimum resolution using those new limits.

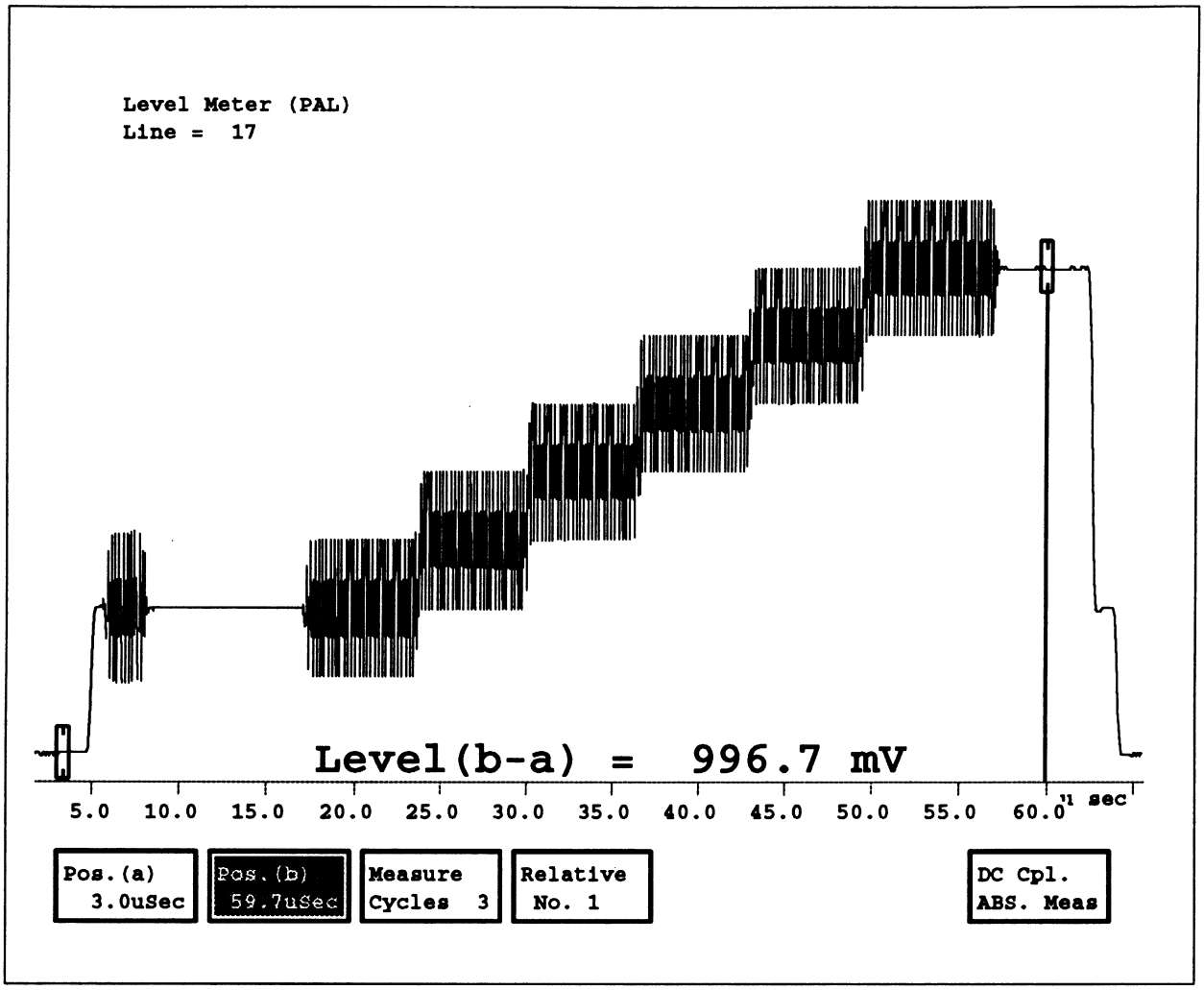

Figure 2-45. Measure Position display for locating the measurement points on a signal.

Setting Up a New Measurement Window

When positioning the cursors to new measurement points on a waveform you can quickly set up a new measurement window that produces a display limit window around the measured value. From that point you may quickly expand the display to increase the resolution of the measurement and adjust the max and min display limits to those needed. If you have specific percentage limits for the max and min display limits from 0 to 10, you may set those percentages in the **Set Min to –nn%** and **Set Max to nn%** softkeys in advance.

To set up a new measurement window:

1. Press the Menu button from the Level Meter without a menu, then select **Measure Position**.
2. Select the a and b cursors in turn and position them to the new measurement points.

NOTE

If a is positioned to a higher amplitude than b, the amplitude difference will be negative.

3. Press the Menu button to return to the first level menu, then touch the **Display Limits** softkey.
4. Touch the **Set Value** softkey, then touch the **Set Value to Result** softkey. This sets the reference pointer to the measured difference between the cursors.
5. Touch the **Min** softkey, then touch the **Set Min to –nn%** softkey.
6. Touch the softkey and touch the **Set Max to nn%** softkey that displays.
7. Press the Menu button to return to the first level menu, then touch **Rescale**.

This sets the measurement window and the reference pointer in the Level Meter display. The vertical scale adjusts to provide optimum viewing of the Level Meter for the limits just set. From this point, you access the Display Limits menu again and set the Max and Min display limits narrower or wider as needed for the value you are monitoring. After setting the limits exactly where you need them, return to the first level menu and touch the **Rescale** softkey again to optimize the Level Meter display for the new display limits.

LINE FREQUENCY

Line Frequency measures horizontal line frequency and field frequency.

Figure 2-46 shows the Line Frequency display. Digital readouts show the line and field frequencies, while a graphical display shows the error from the nominal frequency.

The Line Frequency display can use any video signal as input.

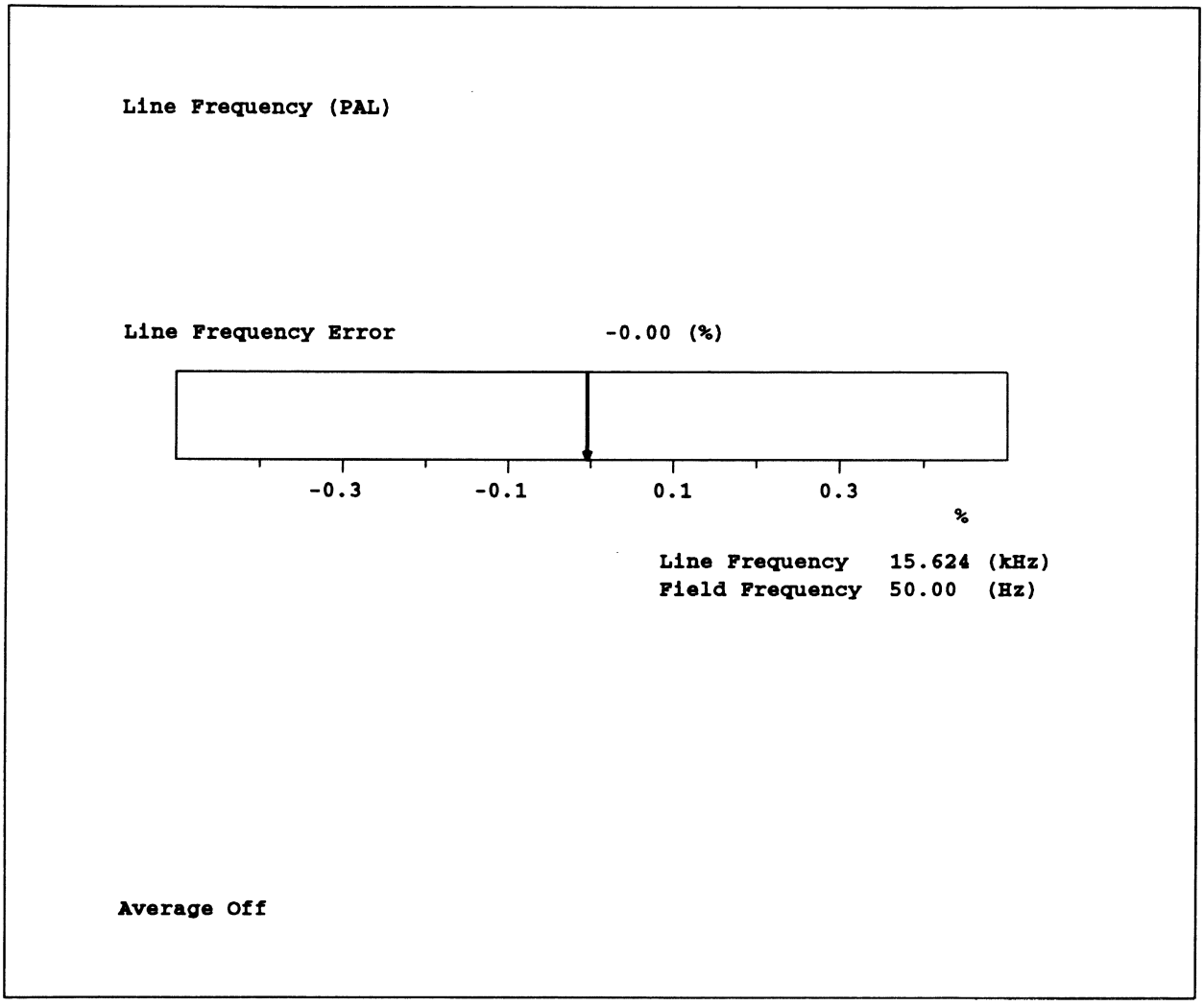

Figure 2-46. Line Frequency display.

Line Frequency Menu

Pressing the Menu button when the Line Frequency measurement runs displays the Line Frequency menu (Figure 2-47).

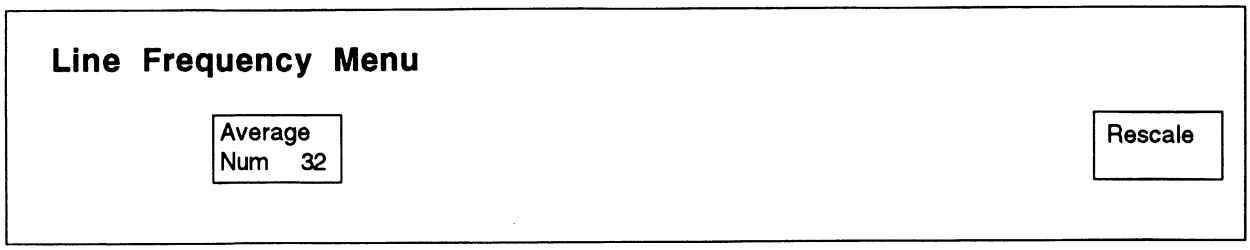

Figure 2-47. Line Frequency menu tree.

MAIN MENU

Average Num

Average Num specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.

Rescale

Rescale sets the expansion factor of the display to an appropriate scaling factor for the Line Frequency measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

LUMINANCE NONLINEARITY

Luminance NonLinearity measures luminance nonlinear distortion.

Figure 2-48 shows the Luminance NonLinearity display. The display plots the step height of each packet, as a percentage of the largest step-size packet. A digital readout of each packet's step size is also provided, as well as a peak-to-peak value showing the difference between the maximum and minimum step sizes.

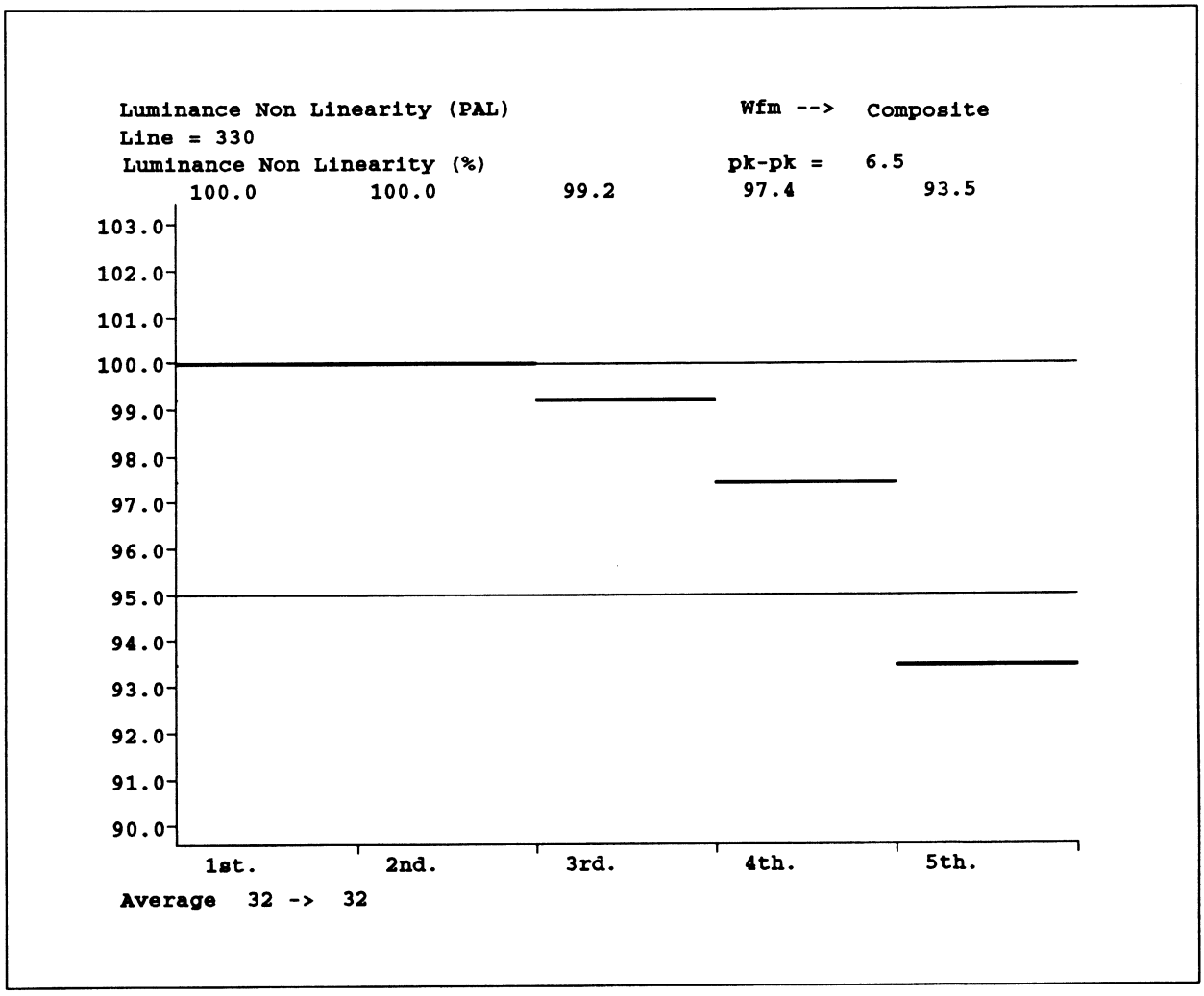

Figure 2-48. Luminance NonLinearity display.

Luminance NonLinearity Menu

Pressing the Menu button when the Luminance NonLinearity measurement runs displays the Luminance NonLinearity menu (Figure 2-49).

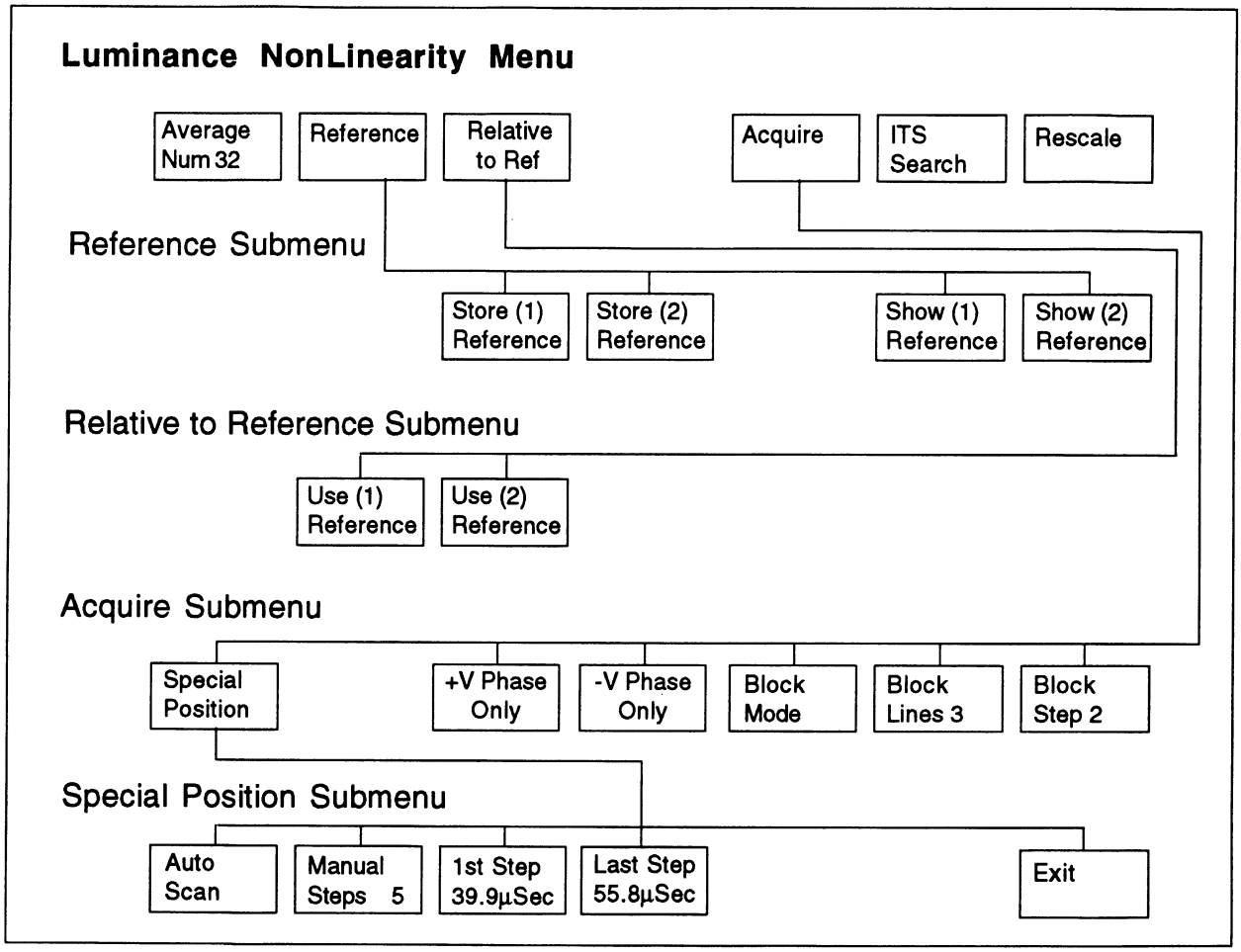

Figure 2-49. Luminance NonLinearity menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) stores the currently displayed values for use as a reference; or (2) displays previously stored reference values.
Relative to Reference	**Relative to Ref** displays a submenu of softkeys to select the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the Luminance NonLinearity measurement.
ITS Search	**ITS Search** searches the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the screen.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Luminance NonLinearity measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (n) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (n) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

ACQUIRE SUBMENU

Special Position	**Special Position** provides softkeys to set the locations on the waveform where the measurement is made. Figure 2-50 shows the Luminance NonLinearity special position display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Auto Scan	**Auto Scan** when highlighted, automatically scans and determines measurement locations. When de-selected, other softkeys (described below) appear to allow you to set measurement locations manually.

NOTE

If severe luminance nonlinear distortion is present, the VM700A may not be able to resolve all the steps that were present in the original signal. In such cases, you must use manual positioning to set the location of each staircase step.

Manual Steps	**Manual Steps** allows the number of luminance steps in the signal to be adjusted by rotating the knob.
1st Step	**1st Step** allows you to adjust the position of the first luminance step edge of the staircase by rotating the knob.
Last Step	**Last Step** allows you to adjust the position of the last luminance step edge of the staircase by rotating the knob.
Exit	**Exit** leaves the Special Position display and returns to the Luminance NonLinearity display.

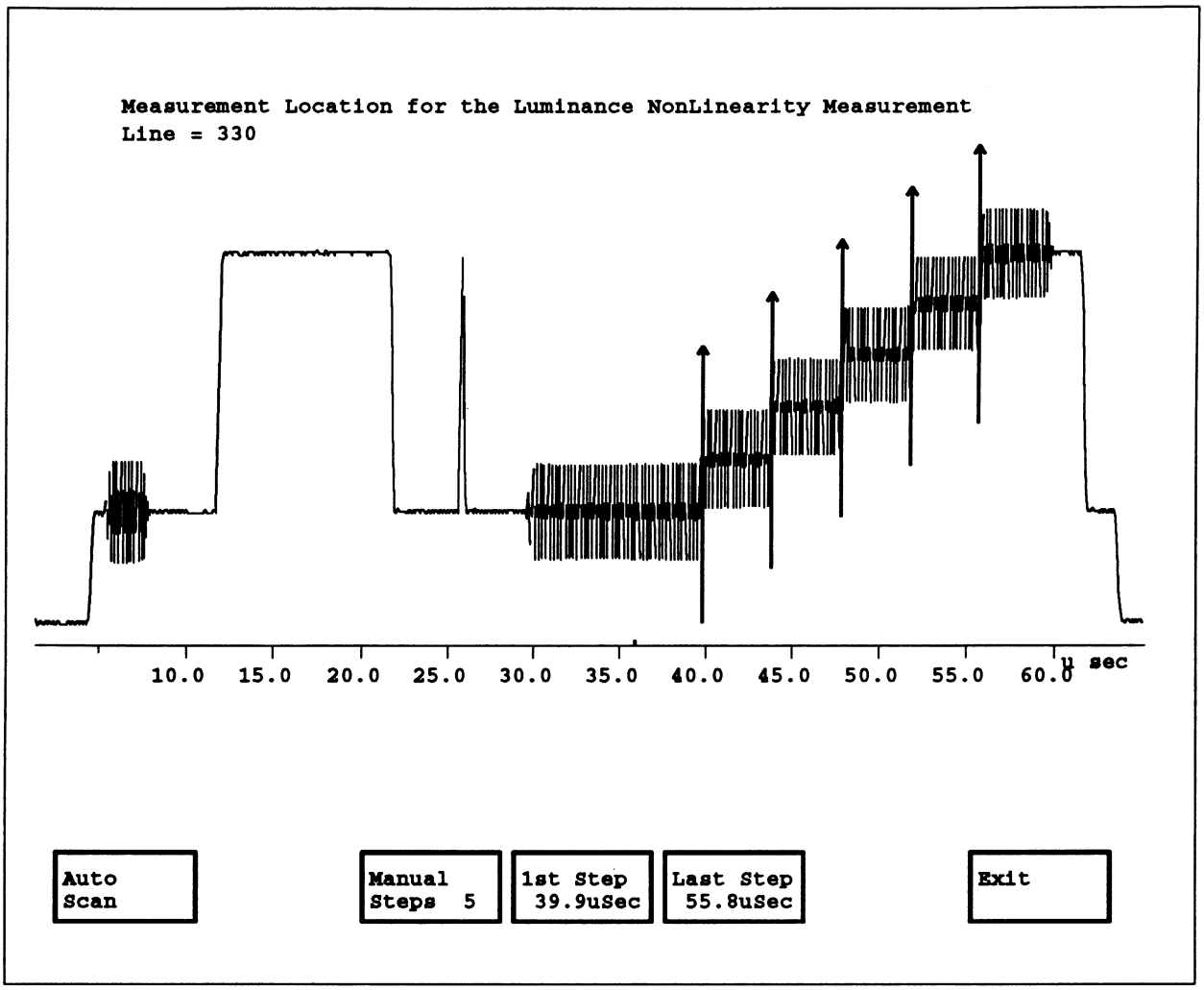

Figure 2-50. Luminance NonLinearity special position display.

MULTIBURST

MultiBurst measures frequency response.

Figure 2-51 shows the MultiBurst display, which plots signal amplitude as a function of difference from the reference frequency.

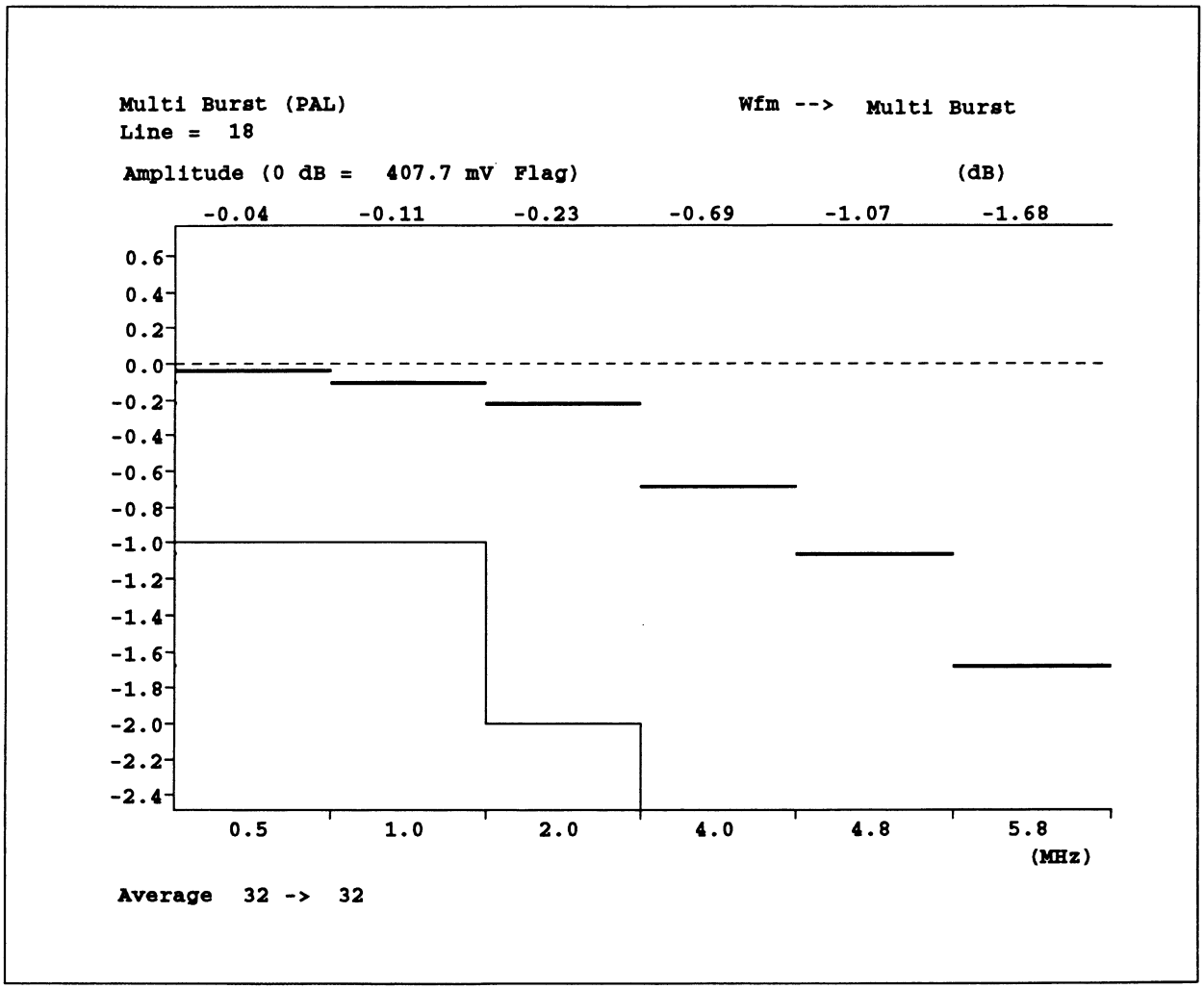

Figure 2-51. MultiBurst display.

MultiBurst Menu

Pressing the Menu button when the MultiBurst measurement runs displays the MultiBurst menu (Figure 2-52).

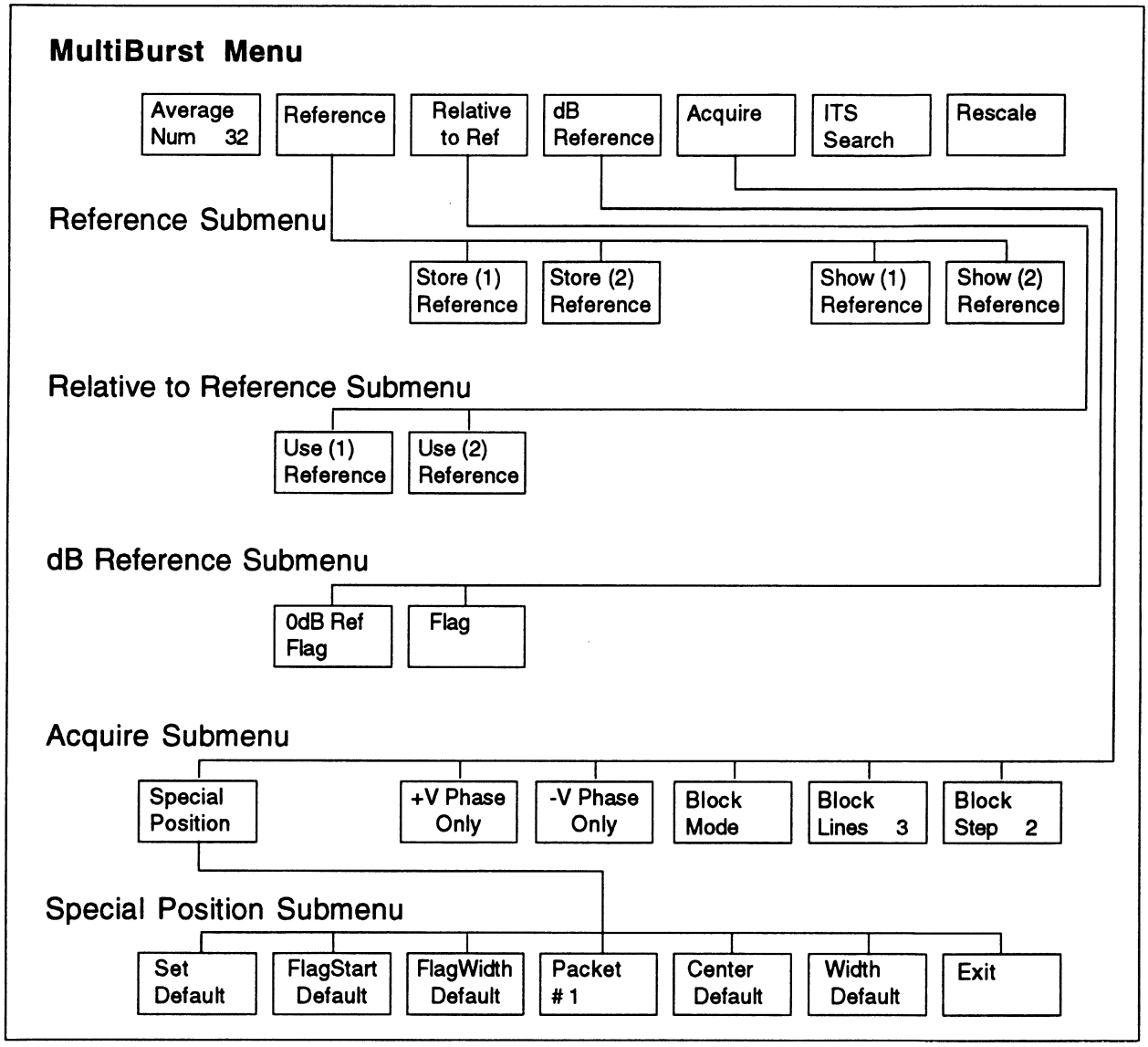

Figure 2-52. MultiBurst menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) stores the currently displayed values for use as a reference; or (2) displays previously stored reference values.
Relative to Reference	**Relative to Reference** displays the Reference submenu which selects the reference to use for comparison in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Cursors	**dB Reference** displays the dB Reference submenu that selects the 0dB reference position by rotating the knob and sets the 0dB reference scale for the percentage of the flag amplitude.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the MultiBurst measurement.
ITS Search	**ITS Search** searches the insertion test signals for a signal appropriate for the measurement. If an appropriate signal is not located, the message **Not found** displays briefly on the screen.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the MultiBurst measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (n) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (n) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

DB REFERENCE SUBMENU

Ref Packet/Flag	**Ref Packet/Flag** allows you to select the 0dB reference position by rotating the knob. Displays a packet number or "Flag."
Flag (Auto)	**Flag (Auto)** sets the 0dB reference scale for the percentage of the flag amplitude.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position submenu that sets the locations on the waveform where the measurement is made. Figure 2-53 shows the MultiBurst Special Position display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

SPECIAL POSITION SUBMENU

Set Default	**Set Default** resets each measurement location to its default position from the Measurement Location file. If another softkey is highlighted, only the location given by the softkey is changed.
Flag Start Default	**Flag Start Default** sets the location of the leading edge of the MultiBurst flag.
Flag Width Default	**Flag Width Default** sets the width of the MultiBurst flag.
Packet #	**Packet #** selects one of the six packets and sets its location and measurement area with two additional softkeys, **Center Default** and **Width Default** (see below). For software version 2.05 and later, the lowest frequency packet in the MultiBurst measurement is 200 kHz. In these software versions, the horizontal scale of the Special Position display shows 5.0 µs as the lowest number. The maximum width of a packet is 5.0 µs.
Center Default	**Center Default** sets the center location of the packet.
Width Default	**Width Default** sets the measurement area of the packet.
Exit	**Exit** leaves the Special Position submenu and displays the MultiBurst screen.

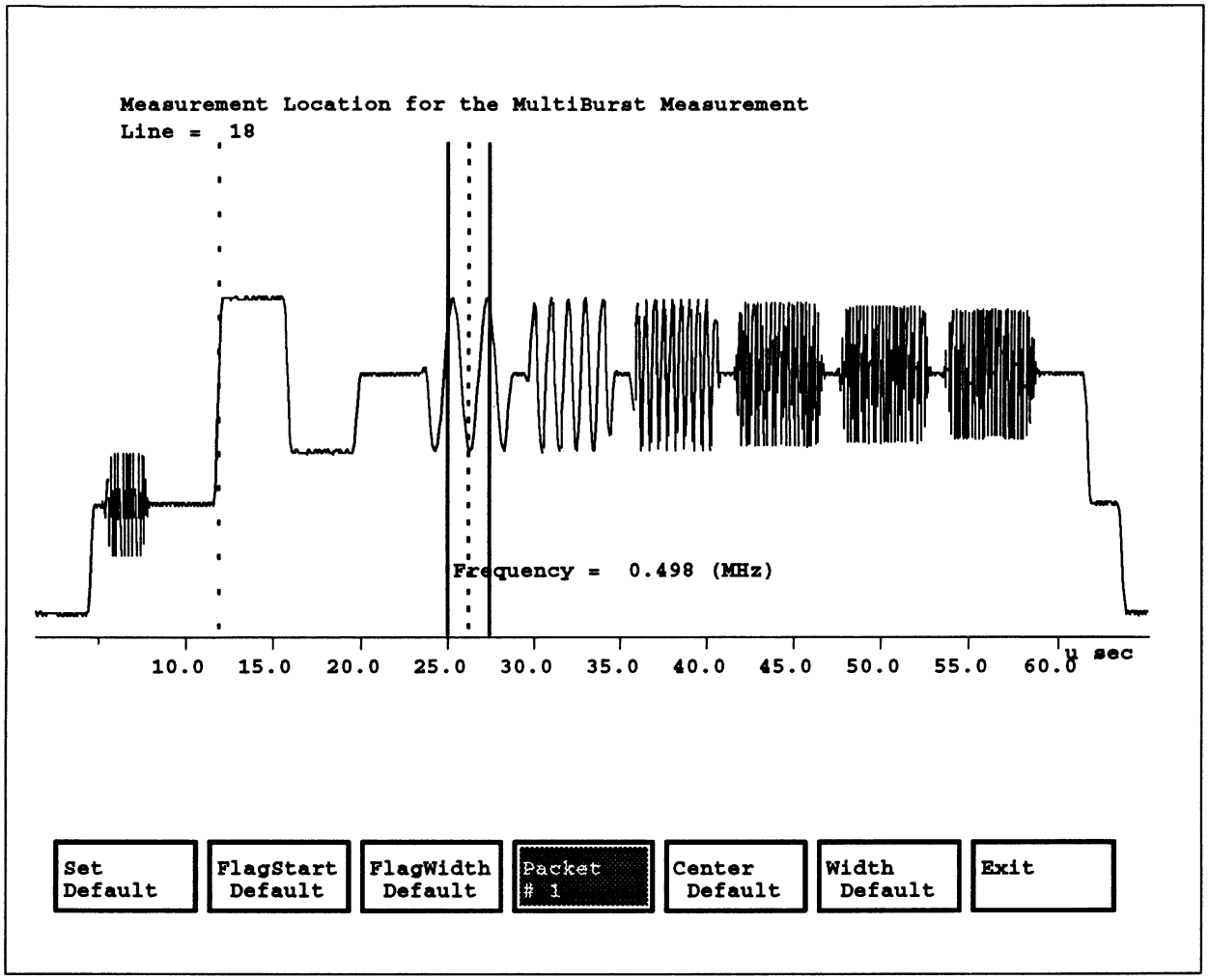

Figure 2-53. MultiBurst special position display.

NOISE SPECTRUM

Noise Spectrum measures noise level and performs spectrum analysis.

Figure 2-54 shows the Noise Spectrum display. The display plots noise level in decibels (where 0 dB=700 mV) vs. frequency (in MHz). A digital readout also displays the rms noise level of the entire bandwidth.

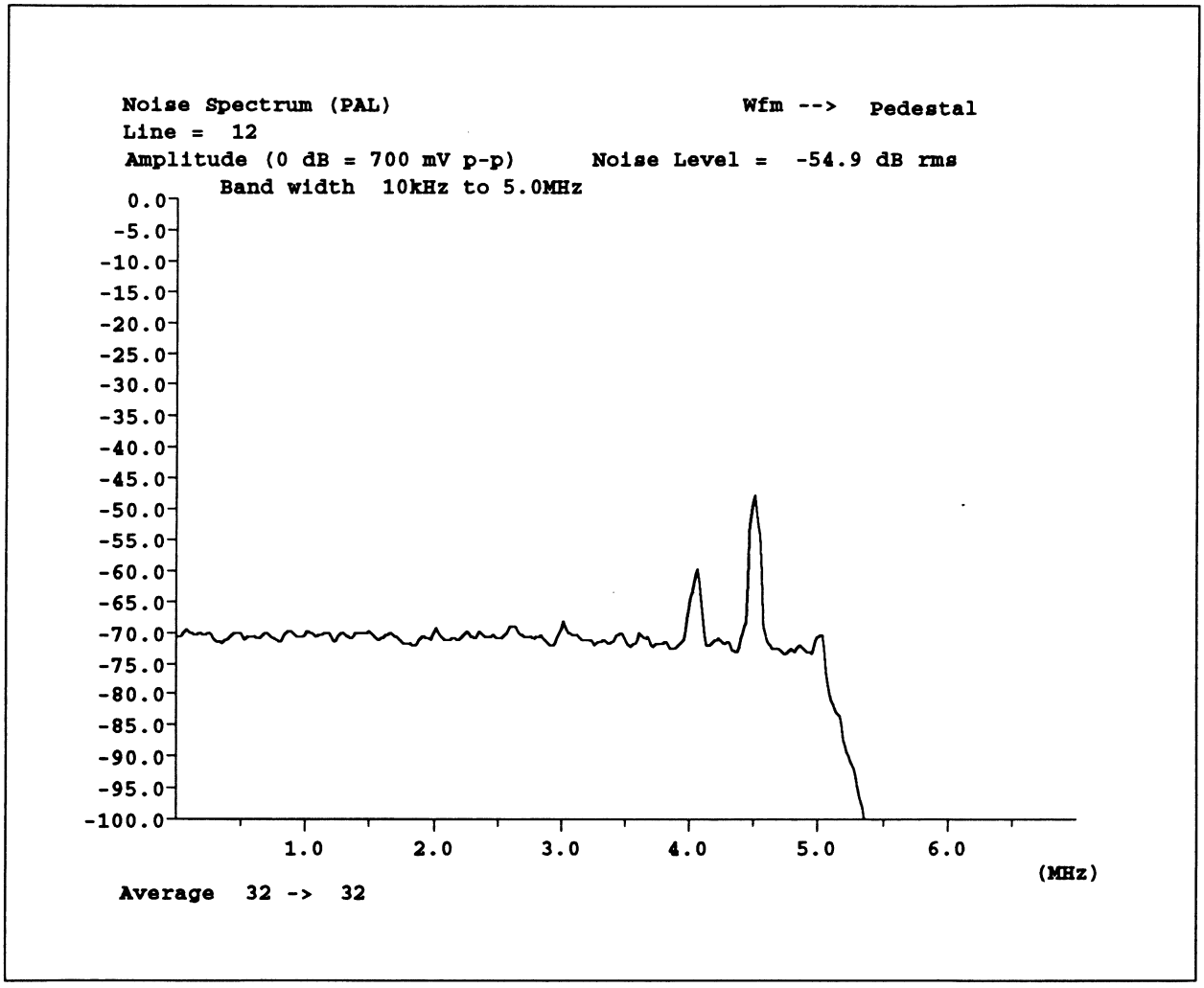

Figure 2-54. Noise Spectrum display.

Noise Spectrum Menu

Pressing the Menu button when the Noise Spectrum measurement runs displays the Noise Spectrum menu (Figure 2-55).

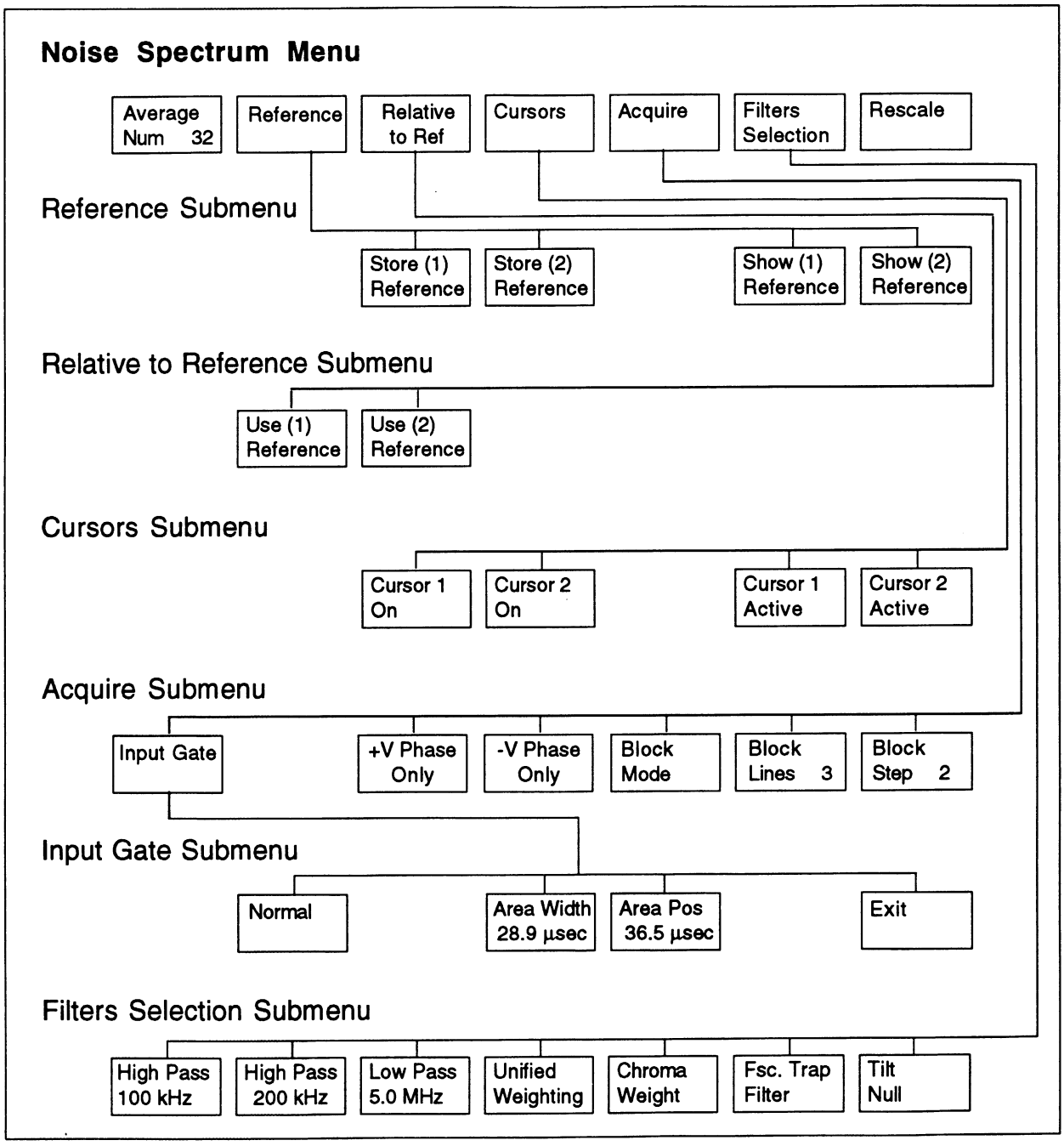

Figure 2-55. Noise Spectrum menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Reference	**Reference** displays the Reference submenu which (1) stores the currently displayed values for use as a reference; or (2) displays previously stored reference values.
Relative to Reference	**Relative to Reference** displays the Relative to Reference submenu which selects the reference to use for compensation in the measurement. When a stored reference is selected, the currently measured value is compared to the stored reference value.
Cursors	**Cursors** Provides softkeys to display and activate the two Noise Spectrum cursors. Readouts for the cursors give the peak-to-peak decibel value at the frequency location of the cursor(s) and the noise level in db (rms) between the cursors.
Acquire	**Acquire** displays the Acquire submenu that controls how the signal is acquired for the Noise Spectrum measurement.
InputGate	**Input Gate** controls the width and position of signal area used for the Noise Spectrum measurement.
Filters Selection	**Filters Selection** provides softkeys to select one or more noise filters or the Tilt Null feature.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the Noise Spectrum measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

REFERENCE SUBMENU

Store (n) Reference	**Store (1) Reference/Store (2) Reference** saves the current measurement values as (1) Reference and (2) Reference, respectively. Selecting Store (1) Reference or Store (2) Reference overwrites previous (1) Reference or (2) Reference values. References are stored in nonvolatile memory and are retained when the VM700A is powered down.
Show (n) Reference	**Show (1) Reference/Show (2) Reference** displays the current values of (1) Reference and (2) Reference, respectively, plus the date and time the reference was stored and the channel the reference signal was on. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

RELATIVE TO REFERENCE SUBMENU

Use (n) Reference	**Use (1) Reference/Use (2) Reference** selects the stored reference to which measured values are compared. If no reference value has been stored, touching either softkey displays a message that the reference is not defined.

CURSORS SUBMENU

Cursor 1/2 On	**Cursor 1/2 On** displays Noise Cursor 1 or 2. The cursor appears in the position it was in the last time the cursor was active.
Cursor 1/2 Active	**Cursor 1/2 Active** enables the knob to move Noise Cursor 1 or 2, and displays the **Nearest Peak** softkey.
Nearest Peak	**Nearest Peak** positions the active cursor on the nearest peak of the Noise Spectrum display.

ACQUIRE SUBMENU

Input Gate	**InputGate** Provides softkeys to control the width and position of the signal area used for the Noise Spectrum measurement. Figure 2-56 shows the Noise Spectrum InputGate display.
+V Phase Only	**+V Phase Only** measures only the +V phase part of the signal.
-V Phase Only	**-V Phase Only** measures only the -V phase part of the signal.
Block Mode	**Block Mode** turns on Block mode. The block starts at the system line.
Block Lines	**Block Lines** sets the number of lines to average for the measurement. The default number of Block Lines to average is 3.
Block Step	**Block Step** sets the number of lines to step in the block. The default number of lines to step is 2.

INPUT GATE SUBMENU

Normal	**Normal** restores the **Area Width** and **Area Pos.** softkeys to their default values.
Area Width	**Normal** restores the **Area Width** and **Area Pos.** softkeys to their default values.
Area Pos	**Area Pos** controls the position of the signal area used for the Noise Spectrum measurement.
Exit	**Exit** leaves the InputGate menu and returns to the Noise Spectrum display.

FILTERS SUBMENU

High Pass 100 kHz	**High Pass 100 kHz** selects the 100 kHz high-pass filter. Signal information below 100 kHz is filtered out.
High Pass 200 kHz	**High Pass 200 kHz** selects the 4.2 MHz low-pass filter. Signal information below 200 kHz is filtered out.
Low Pass 5.0 MHz	**Low Pass 5.0 MHz** selects the 5.0 MHz low-pass filter. Signal information above 5.0 MHz is filtered out.
	Software version 2.05 and later also has a Low Pass 6.0 MHz filter selection. To select the Low Pass 6.0 MHz filter, touch the **Low Pass 5.0 MHz** softkey and turn the knob clockwise. The Low Pass 6.0 MHz filter remains selected until you touch the **Low Pass 5.0 MHz** softkey again and turn the knob counterclockwise, or until the VM700A is powered off.
Unified Weighting	**Unified Weighting** selects the standard CCIR unified weighting filter.
Chroma Weight	**Chroma Weight** filters the signal to display approximately 3 MHz to 6 MHz.
Fsc. Trap Filter	**Fsc. Trap Filter** selects the subcarrier trap filter.
Tilt Null	**Tilt Null** automatically compensates for tilt (horizontal sag) to enable the Noise Spectrum measurement to be taken on a ramp signal. (Note: the noise floor might be slightly higher because the auto gain increase is limited by the larger peak-to-peak amplitude of the signal.)

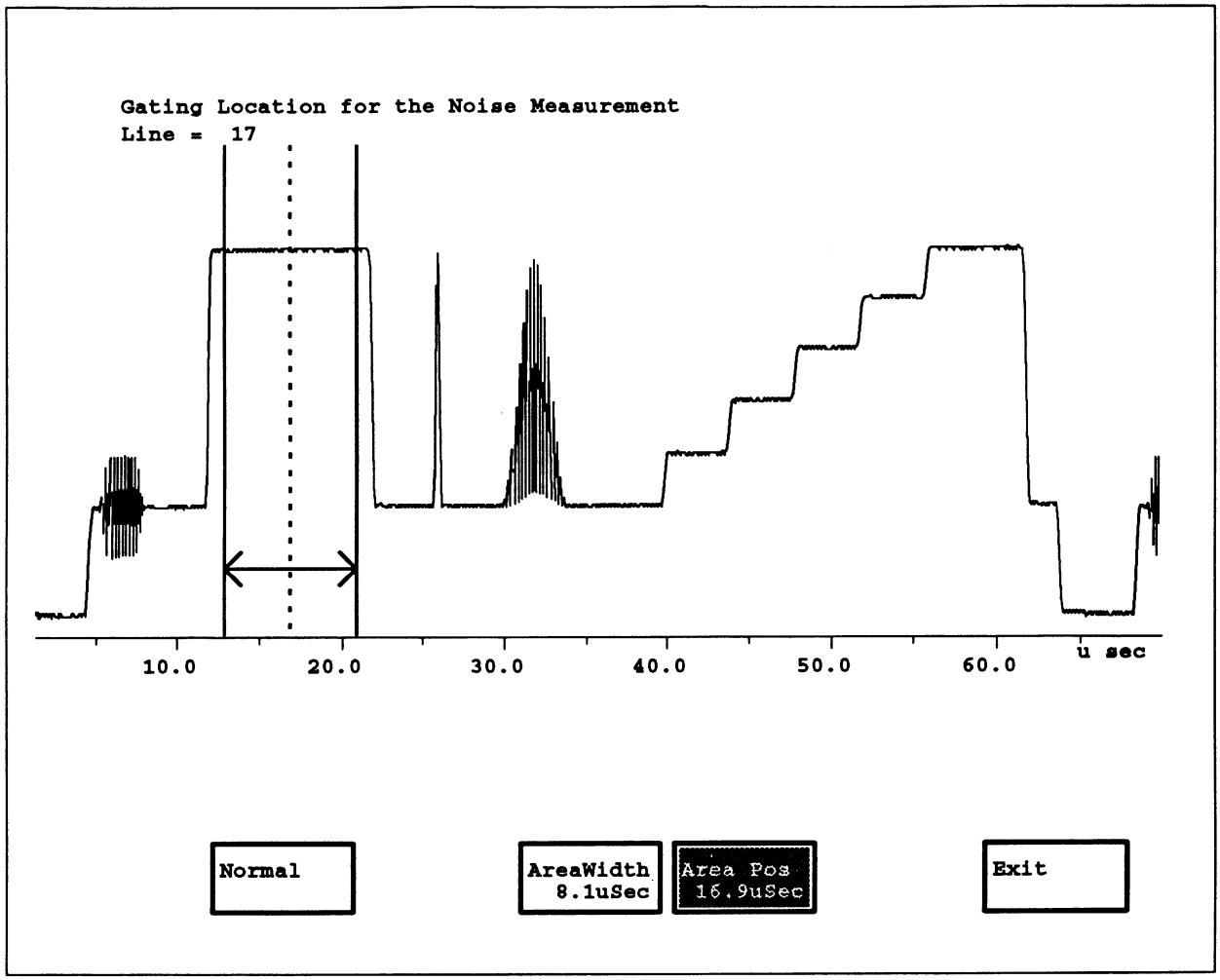

Figure 2-56. Noise Spectrum InputGate display.

SCH_PHASE

SCH_Phase measures subcarrier-to-horizontal phase.

Figure 2-57 shows the SCH_Phase main display.

Figure 2-58 shows the SCH_Phase full-field display.

The SCH_Phase measurement can use any composite video signal for input.

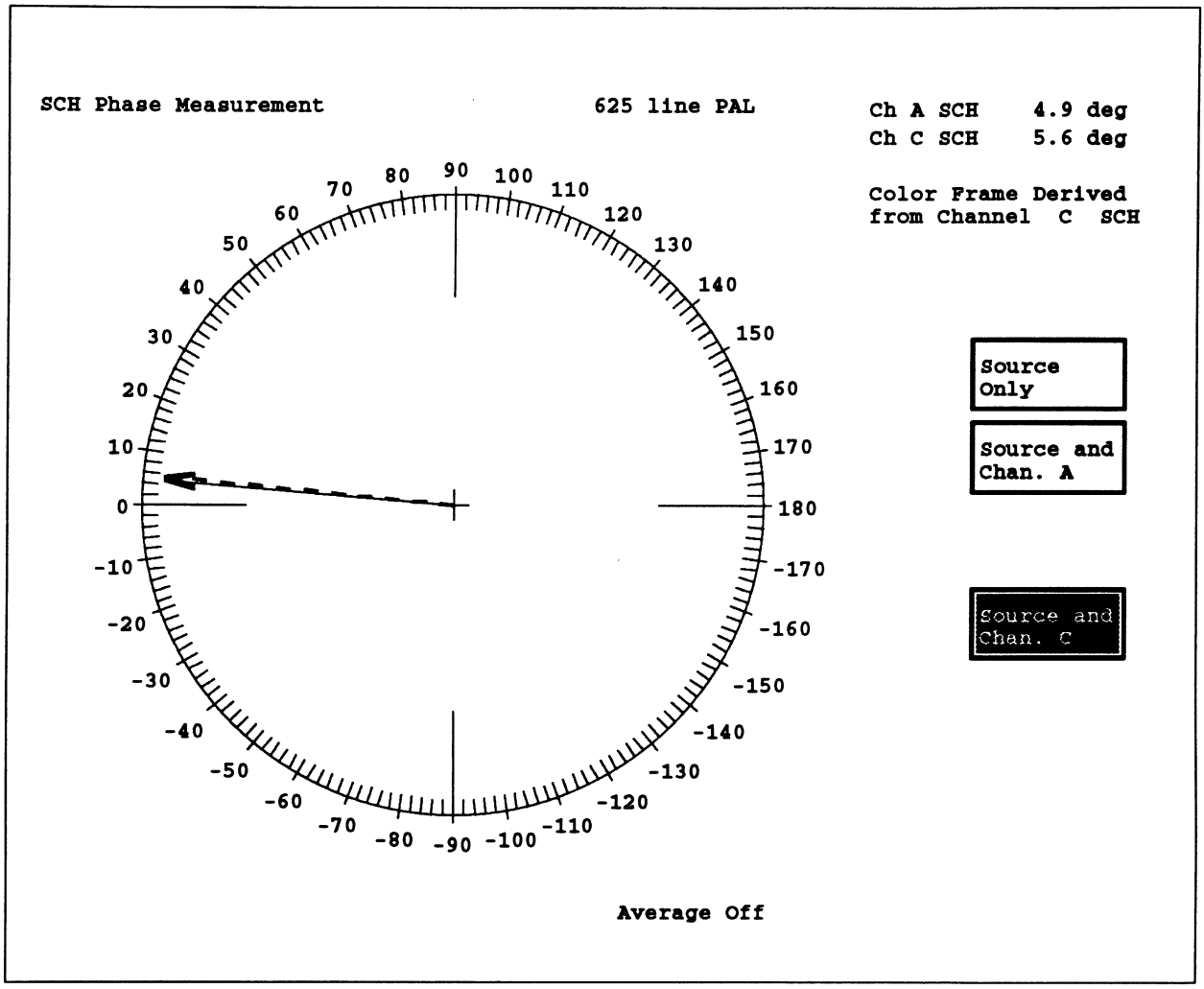

Figure 2-57. SCH_Phase main display.

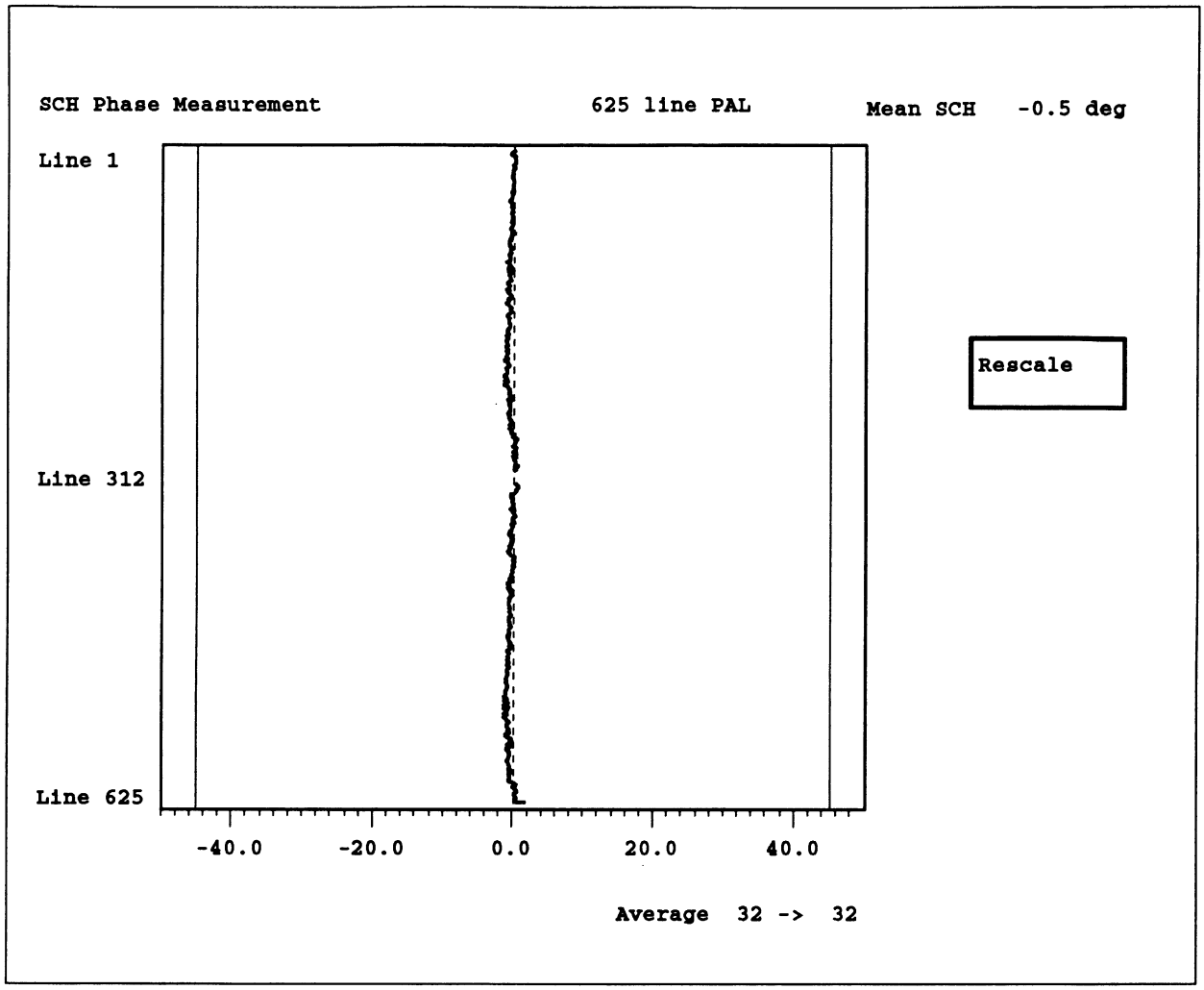

Figure 2-58. SCH_Phase full field display.

SCH_Phase Menu

Pressing the Menu button when the SCH_Phase measurement runs displays the SCH_Phase menu (Figure 2-59).

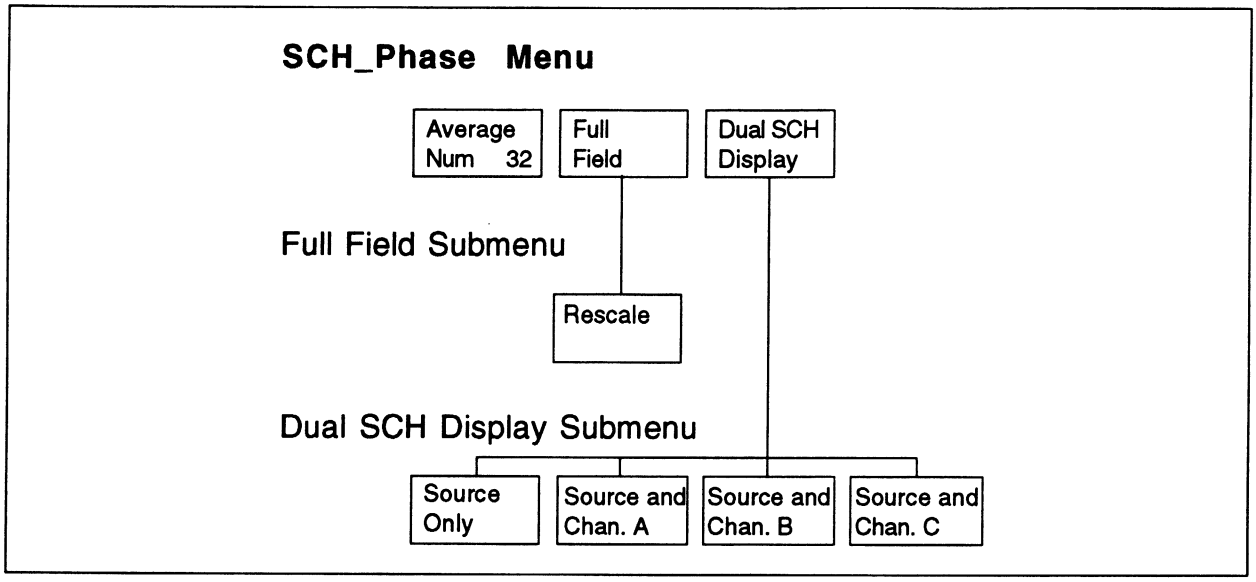

Figure 2-59. SCH_Phase menu tree.

MAIN MENU

Average Num

Average Num specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.

Full Field

Full Field Puts up a display of the SCH values for each line in the frame.

Dual SCH Display

Dual SCH Display Selects the reference channel for color framing. The dual SCH display shows two lines: one for the source, another for the reference channel used for color framing. If the two lines appear on the same side of the vertical center line of the display, then the source and reference channel have the same color frame timing. If they appear on different sides, the source and reference channel have different color frame timing.

FULL FIELD SUBMENU

Rescale

Rescale sets the expansion factor of the display to an appropriate scaling factor for the SCH_Phase measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

DUAL SCH DISPLAY SUBMENU

Source Only

Source Only sets the color framing reference to the current signal source.

Source and Channel

Source and Channel A/B/C sets the color framing reference to Channel A, B, or C, as appropriate.

SHORTTIME DISTORTION

ShortTime Distortion measures the amount of distortion in the reference-to-bar level and bar-to-reference level transitions of a bar signal.

The ShortTime Distortion display (Figure 2-60) plots signal level as a percentage of the voltage difference between the reference level (0%) and the bar level (100%). When the ShortTime Distortion measurement is first invoked in its default mode, a set of graticules appears on the display, indicating the 5% ShortTime Distortion limits for the CCIR-421 standard. The gain on the graticule can be modified by using the **Graticule Gain** softkey in the Graticule sub-menu. You can also define your own graticule with the softkeys in the Make Graticule sub-menu of the Graticule sub-menu. (See "Defining Your Own Graticule," later in this section, for more information.)

Text readouts on the display show

- the name of the measurement (Short Time Distortion)
- the standard of the signal being measured (PAL)
- the type of waveform
- the type (CCIR-421 or Special) and distortion percentage of graticule being used for the measurement
- the amount of distortion in the rising or falling edge of the signal, referenced to the graticule being used
- the rise and/or fall time of the signal in nanoseconds.

The ShortTime Distortion measurement requires a T Bar signal to return a valid ShortTime Distortion measurement. The location of a T Bar signal can be specified in the "T Bar Start (SD)" and "T Bar Width (SD)" lines of the Measurement Locations file.

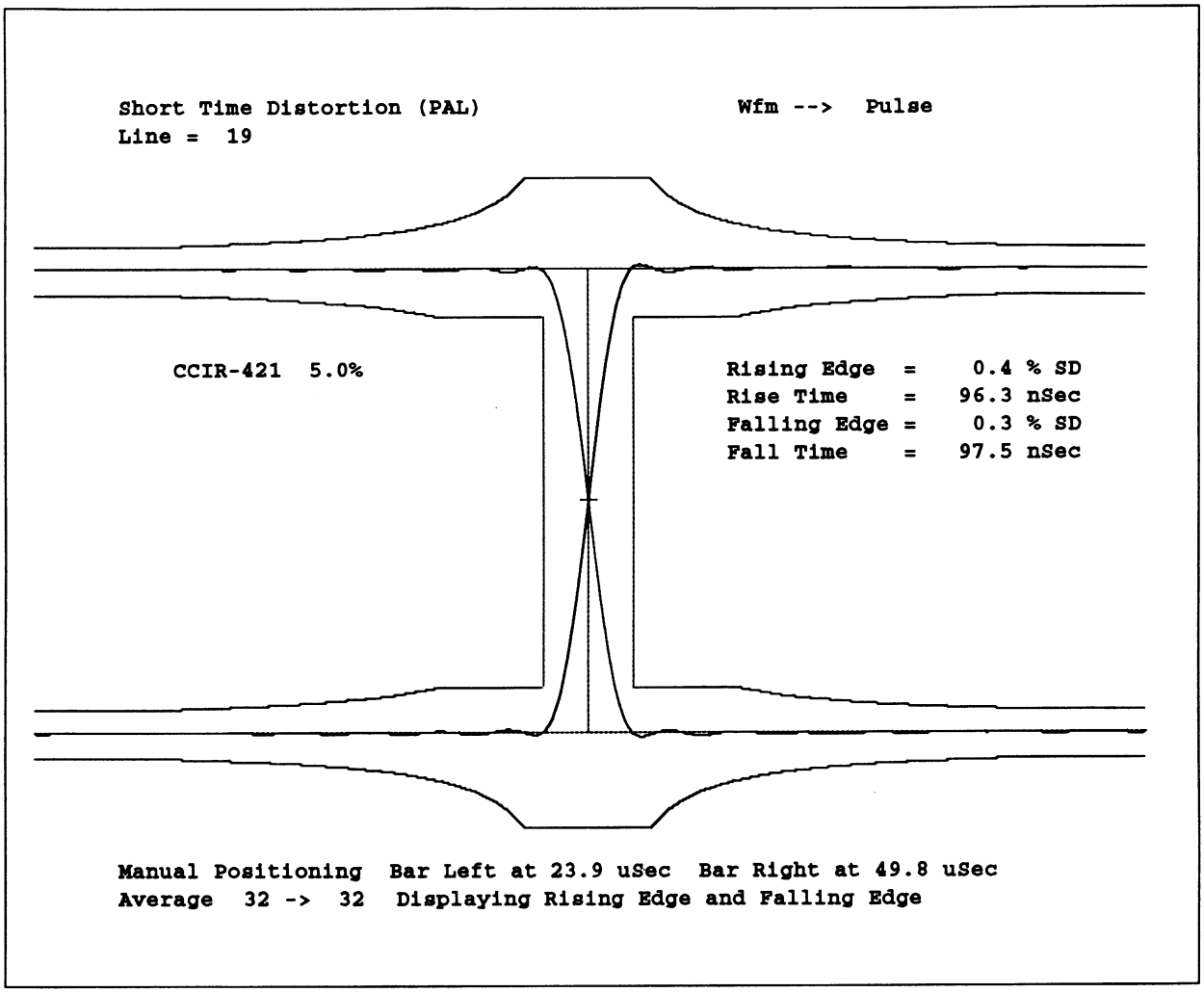

Figure 2-60. ShortTime Distortion display.

ShortTime Distortion Menu

Pressing the Menu button when the ShortTime Distortion measurement runs brings up the ShortTime Distortion main menu (Figure 2-61).

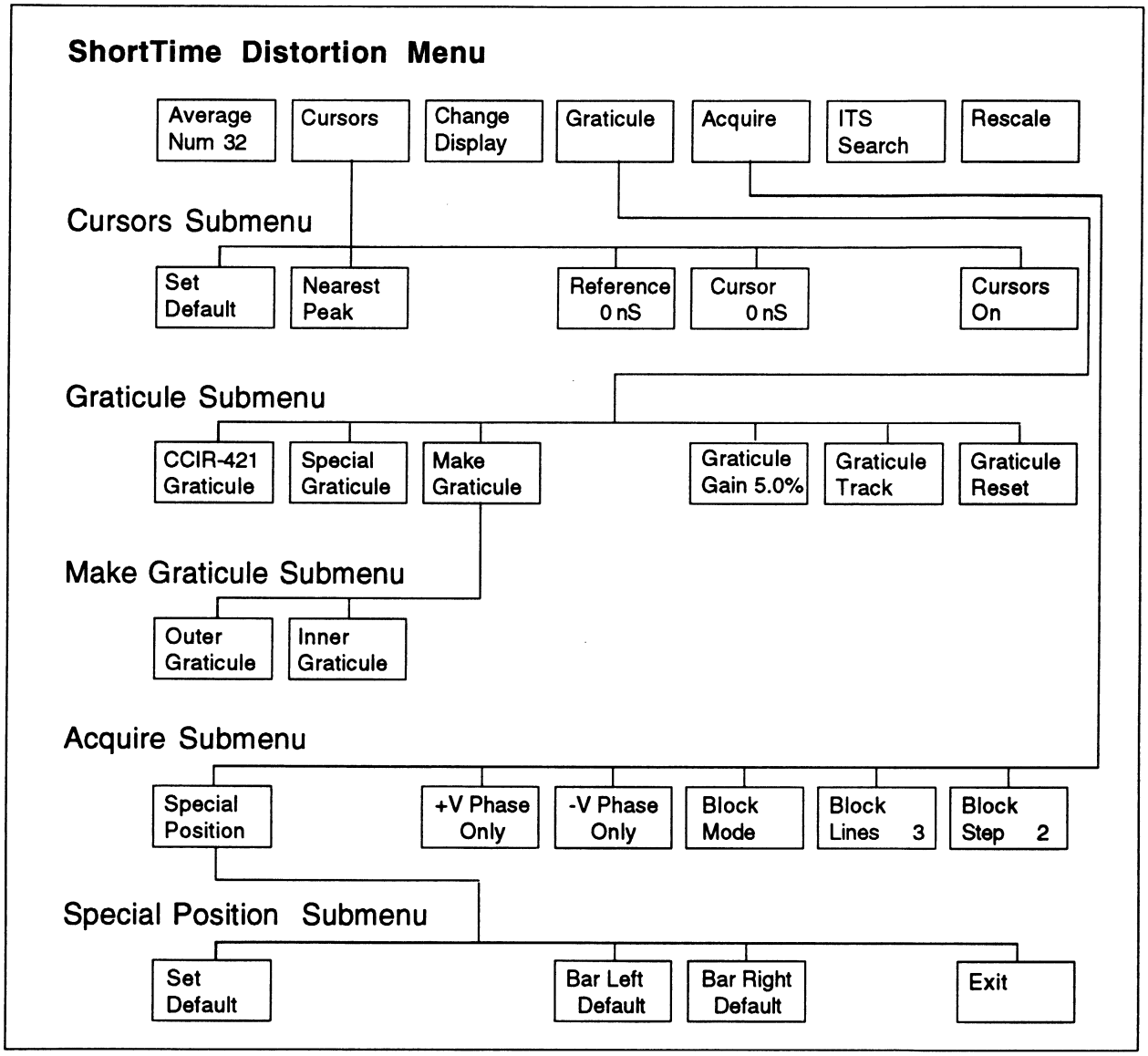

Figure 2-61. ShortTime Distortion menu tree.

MAIN MENU

Average Num

Average Num specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.

Change Display

Change Display toggles the display between Rising Edge only, Falling Edge only, and both Rising Edge and Falling Edge. The text readout on the display follows the graph selected.

Graticule

Graticule displays the Graticule sub-menu, controls the graticule gain and tracking of the current graticule, and to create a user-defined graticule.

Acquire

Acquire displays the Acquire sub-menu, which controls signal acquisition for ShortTime Distortion.

ITS Search

ITS Search searches insertion test signals for a T Bar signal. If an appropriate signal is not located, the message Not found displays briefly on the screen.

Rescale

Rescale sets the expansion factor of the display to an appropriate scaling factor for the measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

GRATICULE SUB-MENU

CCIR-421 Graticule

CCIR-421 Graticule selects the CCIR-421 Standard Short-Time Distortion Graticule.

Special Graticule

Special Graticule selects the Special (user-defined) graticule for ShortTime Distortion measurements.

Make Graticule

Make Graticule brings up the Make Graticule sub-menu, which provides softkeys to define the inner and outer graticules of the Special (user-defined) graticule. This softkey only appears when the **Special Graticule** softkey is highlighted.

Graticule Gain

Graticule Gain adjusts the graticule variable gain. The range is from 0.1% to 20.0%, with a resolution of 0.1%. To adjust the gain, highlight the softkey, turn the knob, then touch the softkey again.

Graticule Track

Graticule Track toggles to turn graticule tracking on or off. When the softkey is highlighted (graticule tracking on), the size of the graticule tracks the actual waveform.

Graticule Reset

Graticule Reset turns off graticule tracking and resets the graticule gain to 5.0%.

MAKE GRATICULE SUB-MENU

Outer Graticule	**Outer Graticule** selects the outer pair of user-defined graticules for editing.
Inner Graticule	**Inner Graticule** selects the inner pair of user-defined graticules for editing.
Set to 0.0	**Set to 0.0** sets the selected variable value to 0. This softkey is only displayed when a coefficient has been selected from one of the three editing lines.
Set to 1.0	**Set to 1.0** sets the selected variable value to 1. This softkey is only displayed when a coefficient other than T has been selected from one of the three editing lines.
Set to -1.0	**Set to -1.0** sets the selected variable value to -1. This softkey is only displayed when a coefficient other than T has been selected from one of the three editing lines.

ACQUIRE SUB-MENU

Special Position	**Special Position** brings up the Special Position display (Figure 2-62) and the Special Position sub-menu, which provides softkeys to set the measurement locations for the ShortTime Distortion measurement.
+V Phase Only	**+V Phase Only** (PAL) makes the measurement on only the +V phase part of the signal.
-V Phase Only	**–V Phase Only** (PAL) makes the measurement on only the –V phase part of the signal.

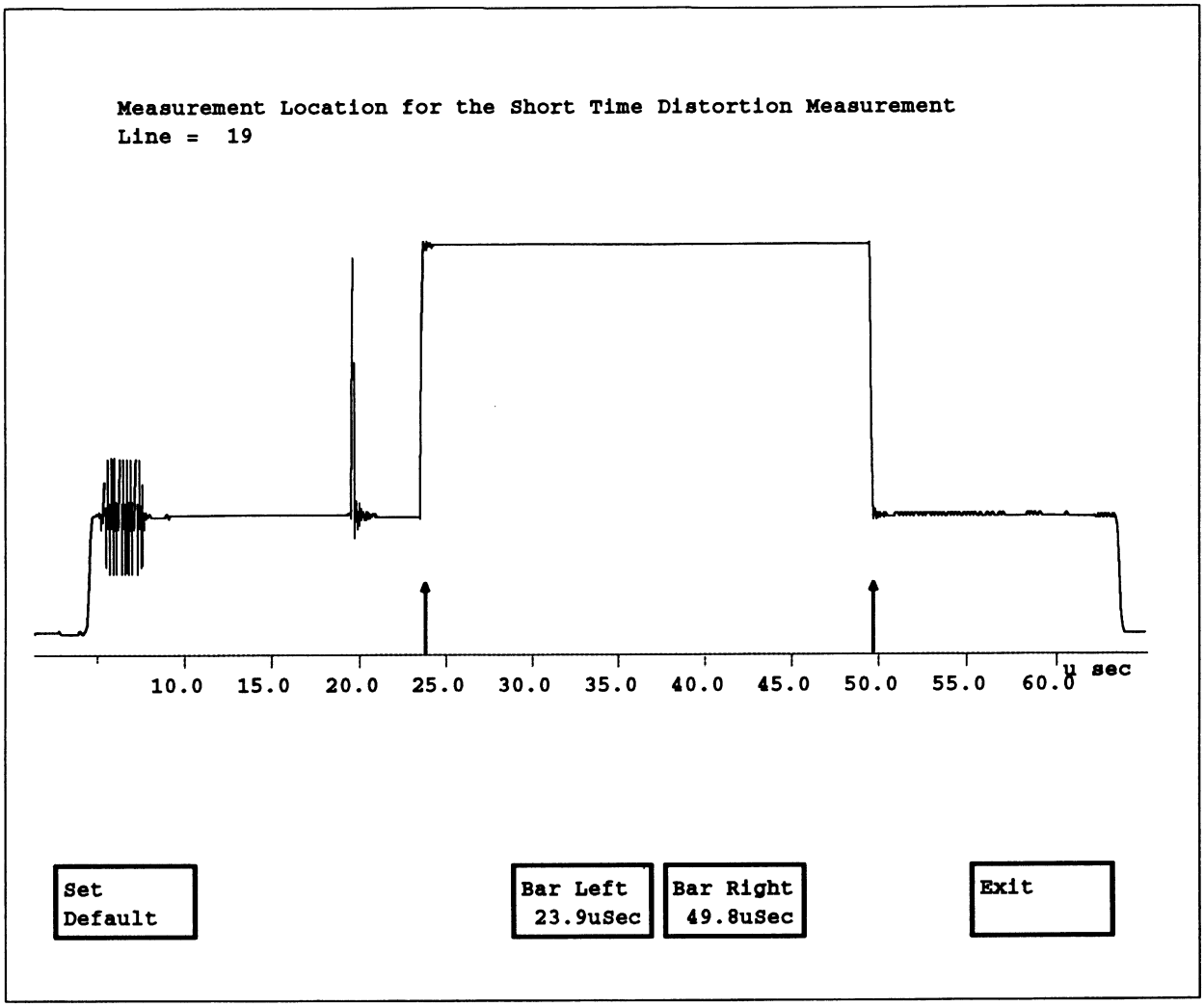

Figure 2-62. ShortTime Distortion Special Position display.

SPECIAL POSITION SUB-MENU

Set Default	**Set Default** resets the selected softkey (Bar Left or Bar Right) to its default location. If none are selected, all are reset. Default locations are specified in the current Measurement Locations file.
Bar Left	**Bar Left** defines the location of the leading edge of Bar, represented by an arrow in the graph. When this softkey is highlighted, use the knob to move the Bar Left position.
Bar Right	**Bar Right** defines the location of the trailing edge of Bar, represented by an arrow in the graph. When this softkey is highlighted, use the knob to move the Bar Right position.
Exit	**Exit** leaves the Measurement Locations display and returns to the ShortTime Distortion display.

Defining Your Own Graticule

The ShortTime distortion measurement's graticule defines the boundaries of the distortion envelope for a given graticule gain setting. The displayed graticule consists of an outer graticule and an inner graticule, mirrored around the 50% level.

You can define your own graticule for the ShortTime Distortion measurement by means of the Make Graticule sub-menu. To access the Make Graticule sub-menu, do the following:

1. Press the Menu button to display the ShortTime Distortion main menu.
2. Touch the **Graticule** softkey.
3. Touch the **Special Graticule** softkey if it is not already highlighted. When **Special Graticule** is highlighted, the **Make Graticule** softkey displays beside it.
4. Touch the **Make Graticule** softkey. The Make Graticule sub-menu, consisting of the **Outer Graticule** and **Inner Graticule** softkeys, should be visible on the display and not highlighted. The top half of the inner and outer graticule pair (i.e., the graticule surrounding the bar-level region) should also display. Any changes made to the top half of the graticules are mirrored in the bottom half.

To change the shape of the outer or inner graticule, touch the corresponding softkey. This displays three editable lines of equations (Figure 2-63).

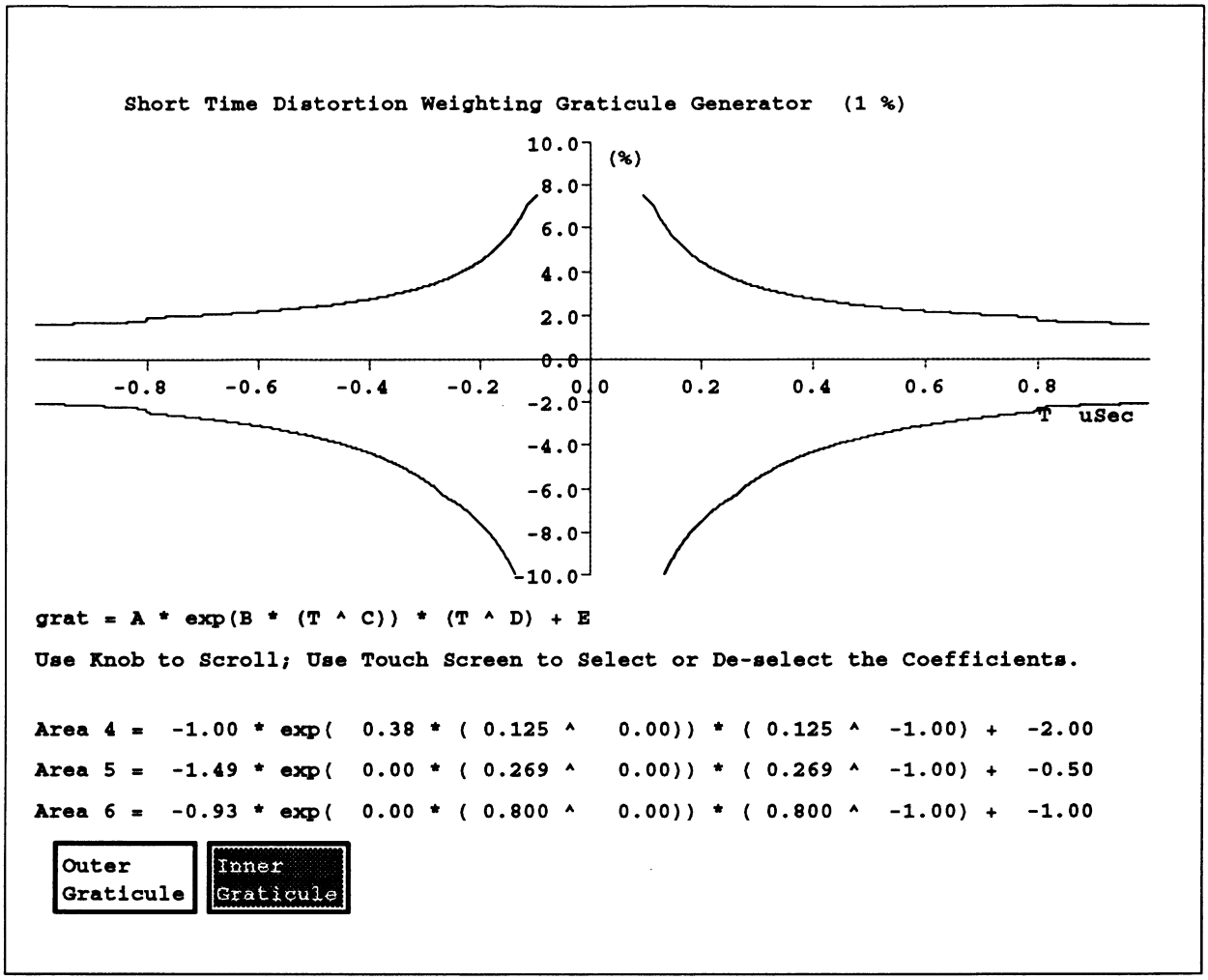

Figure 2-63. Make Graticule display with outer graticule selected.

Each graticule is divided into three areas. Area 1 is innermost, nearest the y-axis. Area 2 is the middle area. Area 3 is outermost, furthest away from the y-axis. The three lines of equations correspond to the three areas of the line being edited.

Editing the equations consist of changing the values of the coefficients in the equation

grat = A * exp(B * (T^C))*(T^D) + E.

To select a line to edit, turn the knob when no coefficient of a line is selected (i.e., no edit box is visible around any coefficient).

To edit a coefficient in the selected line, touch the coefficient you want to edit. For coefficients A, B, C, D, or E, this brings up three more softkeys labeled "Set to 0.0", "Set to 1.0", and "Set to -1.0". (When the T coefficient is selected, only the "Set to 0.0" softkey displays.) To set the value of the coefficient, turn the knob or touch one of the softkeys. The effect of the change on the graticule is shown immediately.

To finish making changes to an equation, touch the selected coefficient. The edit box disappears, and you can then turn the knob to select a new line to edit, or press the Menu button to exit the Make Graticule sub-menu.

NOTE

The Make Graticule sub-menu defines the boundaries of the distortion envelope for 1% gain. The default gain for the main ShortTime Distortion display is 5%. You can adjust the gain value with the ***Graticule Gain*** *softkey of the Graticule sub-menu.*

To adjust the gain, highlight the softkey, turn the knob until the desired gain value displays, then touch the softkey again.

TWOFIELD

TwoField measures field time distortion. It is also useful for quick viewing of certain waveform characteristics.

Figure 2-64 shows the TwoField display. The display plots the amplitude of any combination of sync tip, back porch, luminance, or peak-to-peak chrominance, showing 525 points for each. The items displayed are selected by means of the **TwoField Menu** softkeys; the default is to display sync tip, back porch, and luminance.

The TwoField measurement requires a field square wave as input.

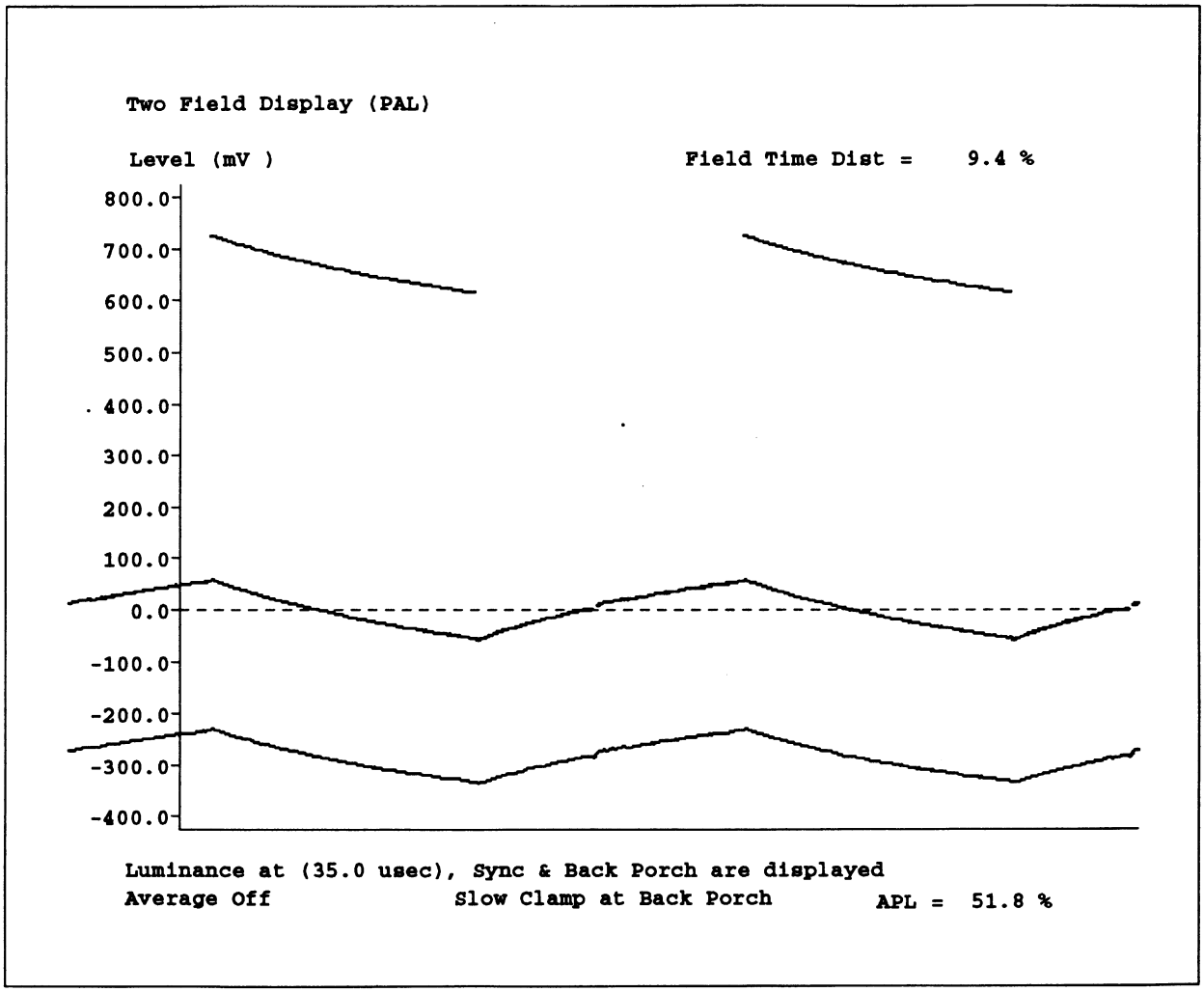

Figure 2-64. TwoField display.

TwoField Menu

Pressing the Menu button when the TwoField measurement runs displays the TwoField menu (Figure 2-65).

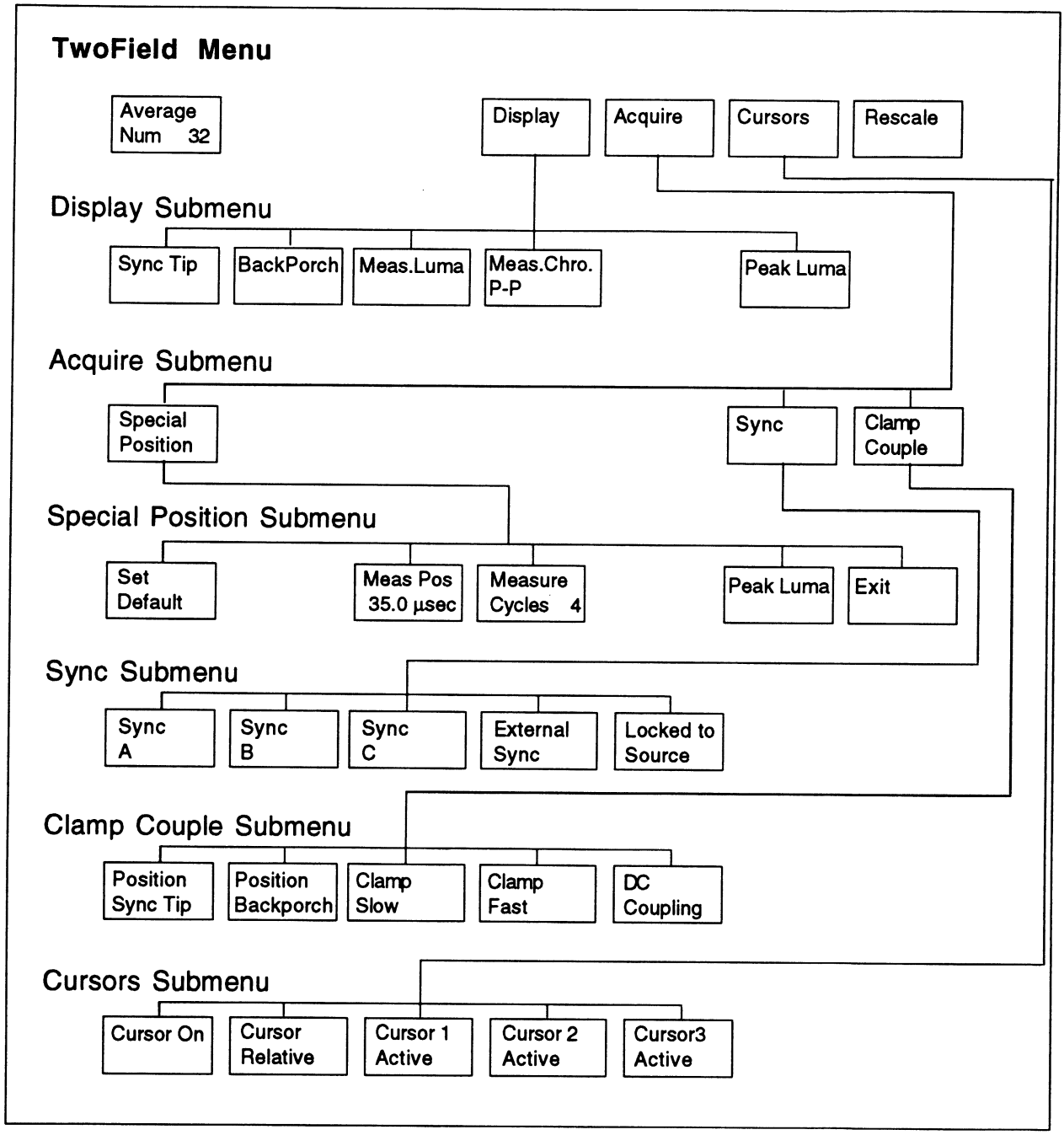

Figure 2-65. Twofield menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Display	**Display** displays the Display submenu for selection of waveforms.
Acquire	**Acquire** displays the Acquire submenu that provides acquisition control.
Cursors	**Cursors** provides softkeys to display and activate the cursors.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the TwoField measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

DISPLAY SUBMENU

Sync Tip	**Sync Tip** selects sync tip for the display.
Back Porch	**BackPorch** selects back porch for the display.
Meas. Luma	**Meas.Luma** selects averaged luminance level at the measurement position for the display.
Meas.Chro P-P	**Meas.Chro P-P** selects averaged chrominance level at the measurement position for the display.
Peak Luma	**Peak Luma** selects peak luminance level in the active area for the display.

ACQUIRE SUBMENU

Special Position	**Special Position** displays the Special Position menu that sets the locations on the waveform where the measurement is made.
Sync	**Sync** provides softkeys to set the sync source.
Clamp Couple	**Clamp Couple** displays a submenu that allows you to set the Clamping mode used by the TwoField measurement.

SYNC SUBMENU

Sync A/B/C	**Sync A/B/C** selects the A, B, or C input for the sync source.
External Sync	**External Sync** selects the external input for the sync source.
Locked to Source	**Locked to Source** selects the sync source to follow the signal source.

CLAMP COUPLE SUBMENU

Clamp Slow	**Clamp Slow** selects slow clamp speed. This speed allows hum effects to be visible, but is useful in coping with large DC offsets on an input signal.
Clamp Fast	**Clamp Fast** selects fast clamp speed. This speed removes DC offset, hum, and bounce effects from the signal. This is the default clamp setting for the TwoField measurement.
DC Coupling	**DC Coupling** selects DC coupling (no clamping).

CURSORS SUBMENU

Cursor On	**Cursor On** displays cursors. Two horizontal cursors appear in the position they were in the last time the cursor was active.
Cursor Relative	**Cursor Relative** selects relative cursor mode. The cursor delta displays relative to the reference.
Set 100%	**Set 100%** stores the current cursor delta as the reference.
Cursor 1/2 Active	**Cursor 1/2 Active** displays cursors and causes the knob to move cursor 1 or 2.
Cursor Track	**Cursor Track** displays cursors and causes the knob to move both cursors.

SPECIAL POSITION SUB-MENU

Set Default	**Set Default** resets the selected softkey to its default value, or resets all of the softkeys, if no softkey is currently selected at this level. Deselects peak luminance mode.
Meas. Pos	**Meas. Pos** chooses where the measurement is made. The center tick of the displayed box shows the measurement position. Select and turn the knob to change the location from the horizontal sync.
Measure Cycles	**Measure Cycles** chooses how many chrominance subcarrier cycles are averaged for the measurement. The width of the displayed box shows the measurement area determined by the selected number of cycles. Select and turn the knob to change the number of cycles.

Peak Luma	**Peak Luma** selects peak luminance level in the active area for the display.

Exit	**Exit** leaves the Special Position display and returns to the Two Field Distortion display.

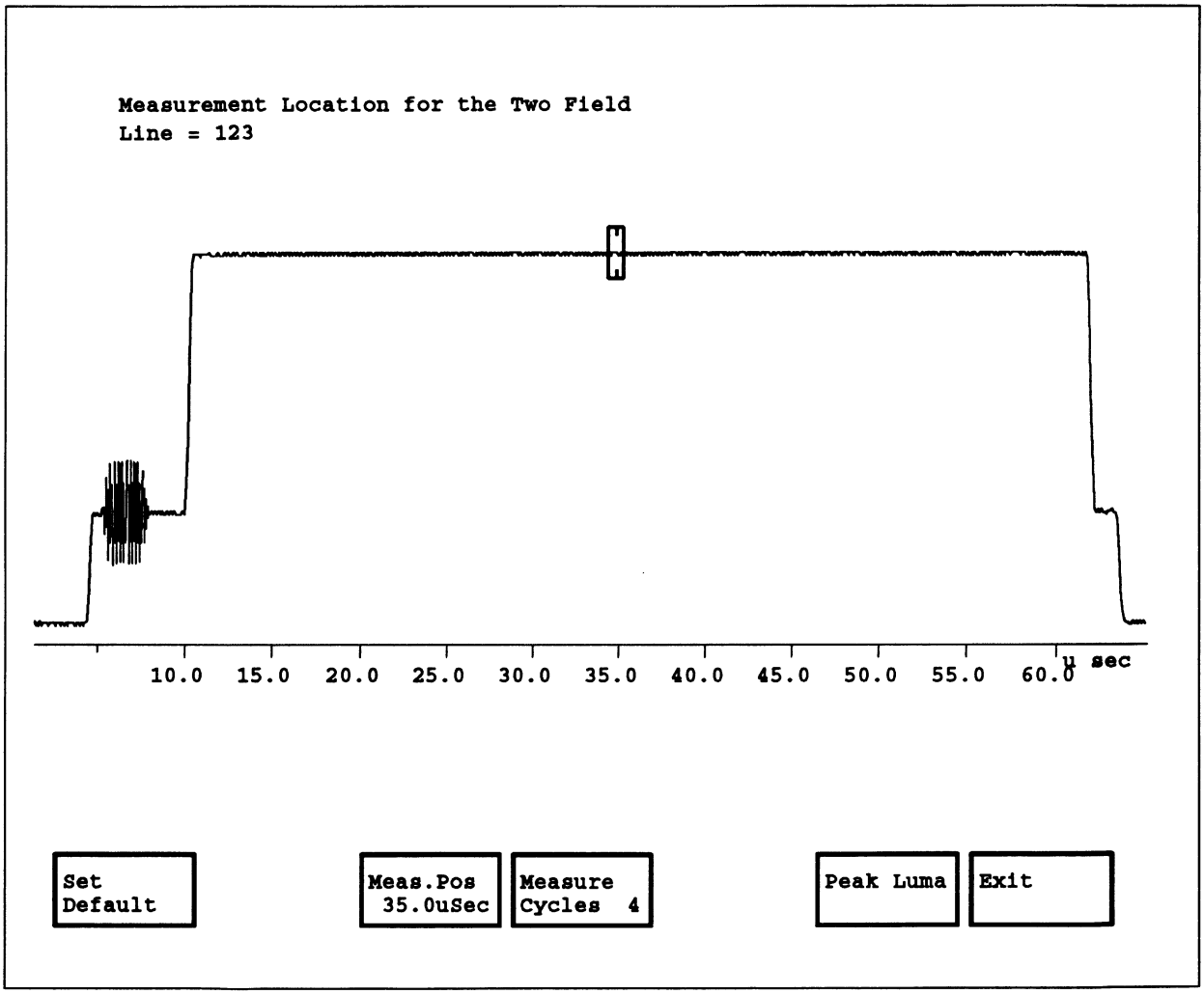

Figure 2-66. TwoField special position display.

V_BLANK

V_Blank shows vertical blanking waveforms and measures pulse widths and rise and fall times for the equalizer and serration pulses.

Figure 2-67 shows the full V_Blank display, which diagrams the vertical blanking intervals of 32 lines from each of four color fields. The current system line is indicated by a bracket beneath it. You can select a new system line by touching any line on the display.

Figure 2-68 shows the V_Blank equalizer pulse display, showing the width, rise time, and fall time of the equalizer pulse.

Figure 2-69 shows the V_Blank broad pulse display, showing the width, rise time, and fall time of the broad pulse.

Figure 2-70 shows the V_Blank V-sync display. This is essentially the same as the full V_Blank display, except that the vertical sync area is shown.

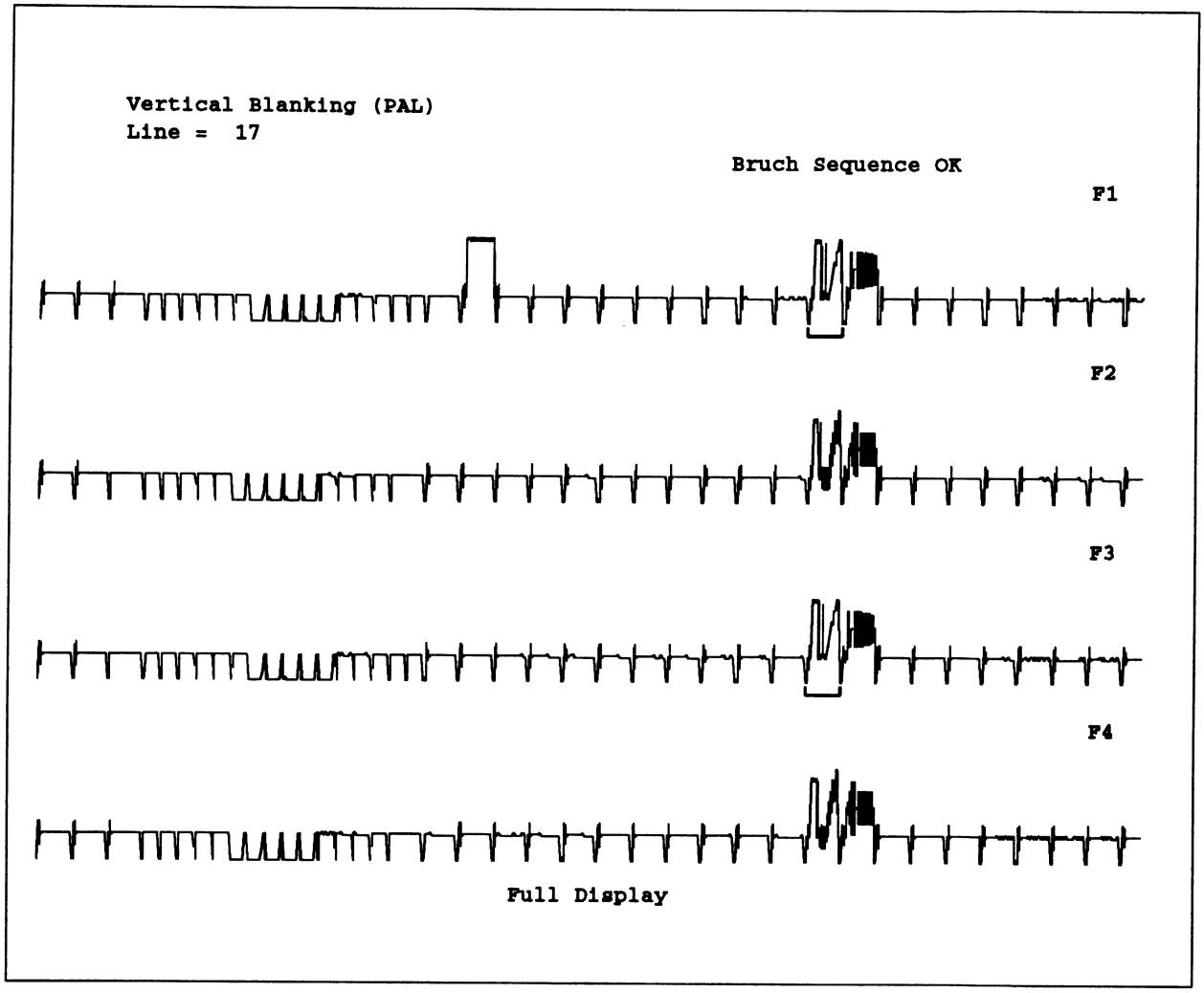

Figure 2-67. V_Blank full display.

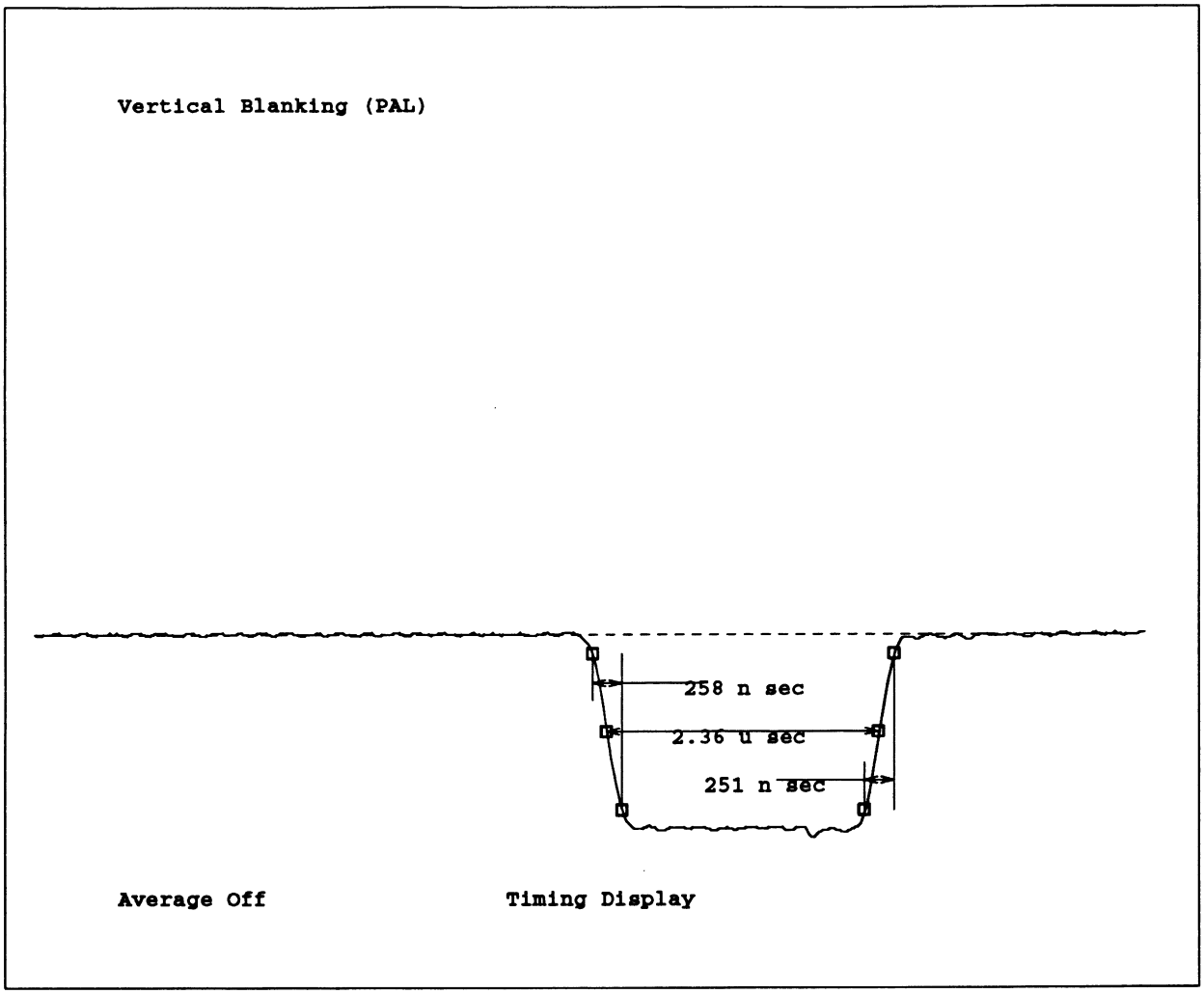

Figure 2-68. V_Blank equalizer pulse display.

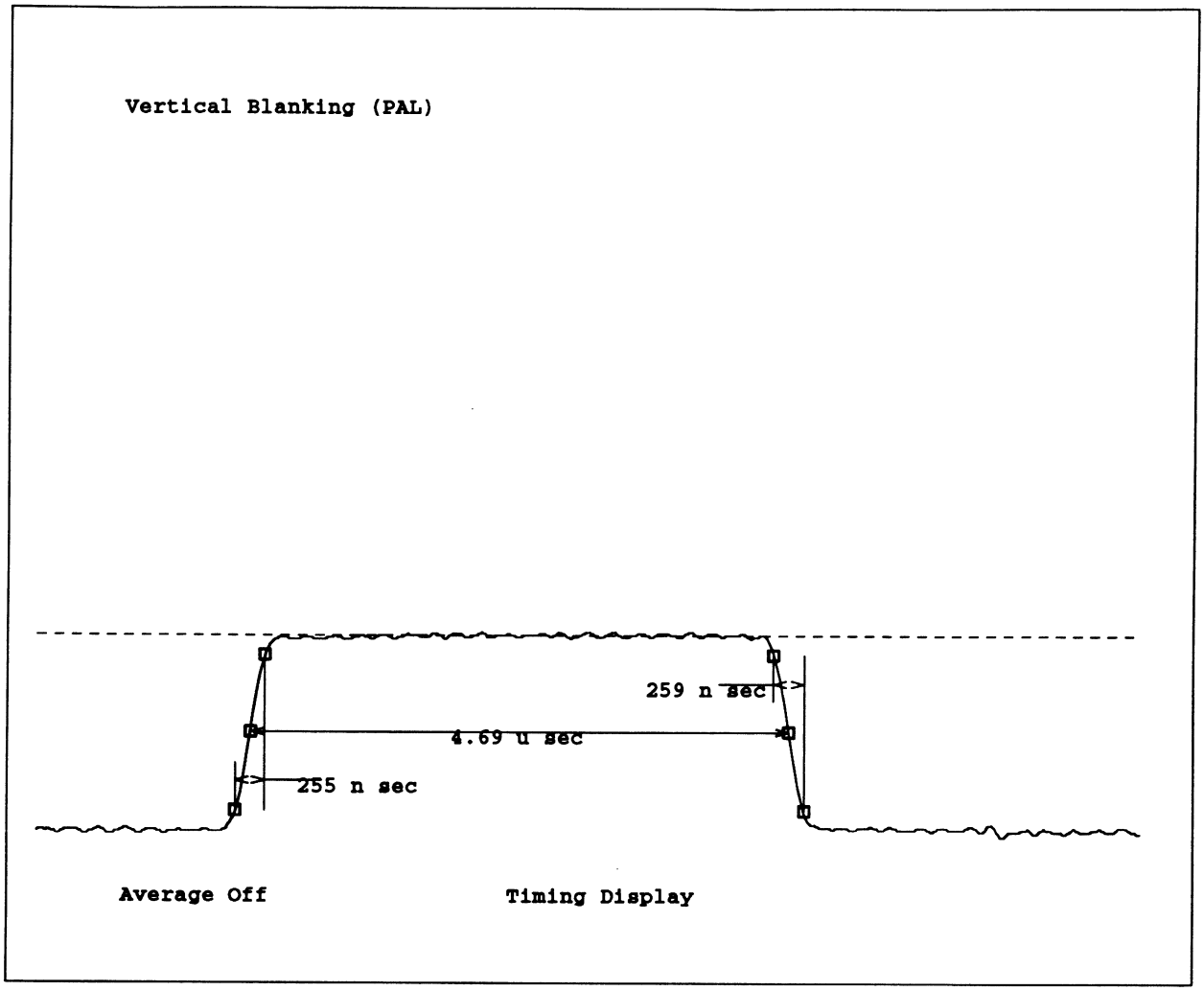

Figure 2-69. V_Blank broad pulse display.

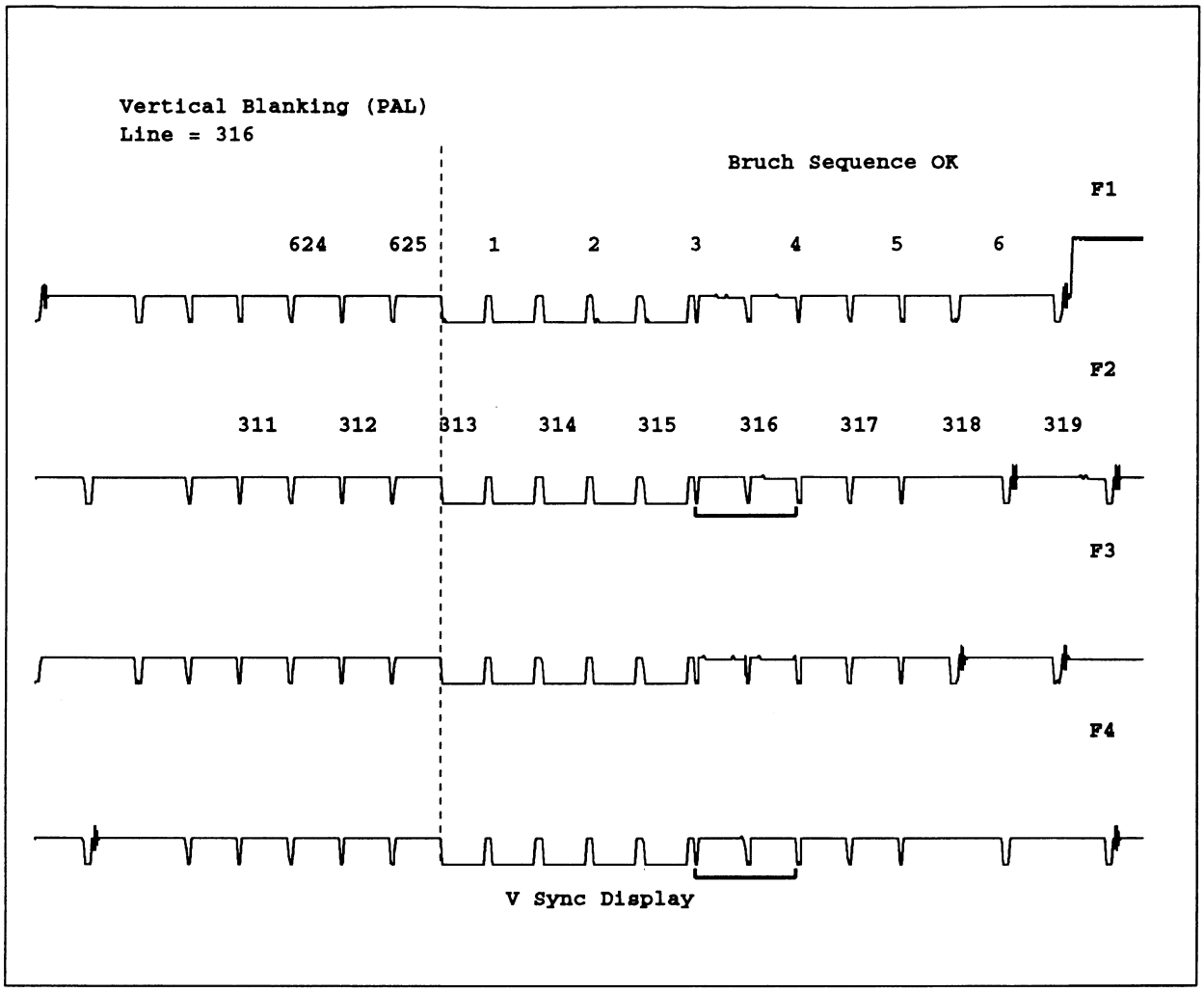

Figure 2-70. V_Blank V-sync display.

V_Blank Menu

Pressing the Menu button when the V_Blank measurement runs displays the V_Blank menu (Figure 2-71).

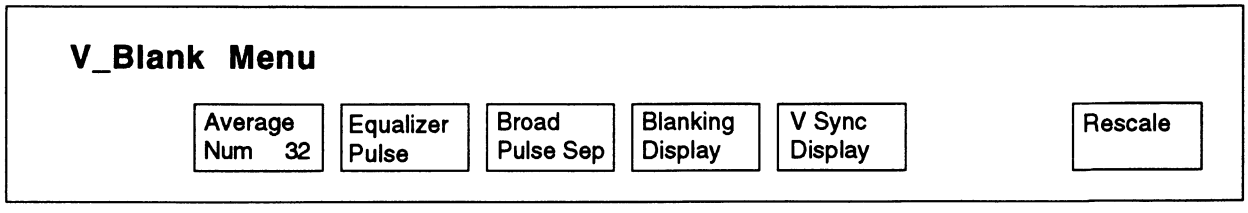

Figure 2-71. V_Blank menu tree.

MAIN MENU

Average Num	**Average Num** specifies the weighting factor to use for averaging. The Average Num range is 1 to 256. The default value is 32. To change the Average Num value, touch the **Average Num** softkey to highlight it, rotate the knob until the desired weighting factor appears, then touch the **Average Num** softkey again.
Equalizer Pulse	**Equalizer Pulse** displays an equalizer pulse and measures it.
Broad Pulse	**Broad Pulse** displays a broad pulse and measures it.
Blanking Display	**Blanking Display** displays the vertical blanking sections of four fields. Each field has 32 lines in the display area.
V Sync Display	**V Sync Display** displays the vertical sync sections of four fields. Each field has 11 lines in the display area.
Rescale	**Rescale** sets the expansion factor of the display to an appropriate scaling factor for the V_Blank measurement's display graticule. The x- and y-axes adjust to accommodate the rescaled display.

VIDEO STANDARD

Video Standard recognizes the standard of the current input source (NTSC or PAL).

When running a dual-standard VM700A (for example, an instrument equipped with both Option 01, NTSC, and Option 11, PAL), it is possible to connect a signal of one standard to a channel that is expecting another. The Video Standard "measurement" guards against this error.

When you press the Measure button and touch the **Video Standard** softkey, the VM700A recognizes the standard of the incoming signal on the current channel, then uses the correct Video_Source File for that standard.

NOTE

*When Video Standard changes the standard for a source, the change is NOT reflected in the display shown when you touch the **Video Source** softkey. Also, executing a function that includes a RestoreConfig command may restore incorrect values into the Video Source file.*

Video Standard stores its measurement results in the "Measurement Results" directory in /nvram0/ConfigFiles. To view Video Standard's measurement results, press the Configure button, then touch **Configure Files**, **Measurement Results**, and **Video Standard**. The file shows the time that Video Standard was last executed, and lists the standard recognized for each input channel. If no standard was recognized for a channel, "----" displays as the measurement result.

Section 3
AUTO MODE MEASUREMENTS

INTRODUCTION

The VM700A's Auto mode performs many industry-standard measurements with great speed and accuracy. To do so, the VM700A selects portions of the video input signal, converts them from analog to digital representation, then analyzes the digitized values to produce numeric measurement results.

This section lists all the PAL Auto mode measurements and their descriptions. Each Auto measurement is listed, along with a brief description of how the data is acquired, a list of the measurement results that are produced, and a description of how each result is obtained. In general, the analysis methods are similar to those currently used throughout the television industry.

Measurement	Units	Description
Source ID		The code derived from a series of pulses found on the Source ID line is matched with corresponding text in the Video Source Identification file. The start of the pulse is defined as Source ID Start in the Measurement Locations file. The first and last pulses are thrown away as start and stop bits. The pulses in between are decoded as a binary number, where the least significant bit is the location immediately following the start pulse. There must not be anything prior to the start pulse greater than 1/2 of the pulse amplitude.
Luminance Bar Ampl	mV	The difference in voltage level between Luminance Bar Reference and Black Level Reference. The user may specify the locations in the Measurement Locations file.
Luminance Bar Ampl	% Carr	The bar amplitude in mV, divided by the carrier amplitude. The carrier amplitude is the difference in voltage level between Zero Carrier Pulse Center and burst center, plus the sync amplitude. Zero Carrier Pulse Center may be user-specified. If sync amplitude could not be determined, or if the voltage level at Zero Carrier Pulse Center is lower than the voltage level at Luminance Bar Reference, this measurement is not performed.
Lum Bar Ampl Err	%	The difference between nominal bar amplitude (700 mV) and the bar amplitude in mV is taken as a percentage of the nominal bar amplitude. If the actual bar amplitude is higher, the result is positive.
Line Time Distortion	% Bar	Ignoring the first and last µsec of the bar, the maximum deviation (either positive going or negative going) from the bar level at Luminance Bar Reference is taken as a percentage of bar amplitude.
Bar Tilt (Rec 569)	% Bar	The difference in voltage levels at 1 µsec after the leading edge of bar and 1 µsec before the trailing edge of bar is taken as a percentage of bar amplitude. The result is positive if the voltage level at 1 µsec before the trailing edge is greater.
Bar Rise Time	ns	The bar amplitude at leading edge is calculated by finding the voltage difference at 1 µsec before and 1 µsec after the 50% point of the leading edge. The 90% and 10% of the leading edge are found using this amplitude value, and the time difference is calculated.
Baseline Distortion	% Bar	The difference in voltage levels between the Black Level Reference and at 400 nSec past the 50% trailing edge of bar is taken as a percentage of bar amplitude. The result is positive if the level at 400 nSec past the 50% trailing edge is the greater of the two.
Blanking Level	% Carr	The difference in voltage levels at burst center and sync center is calculated. This difference is then subtracted from the carrier amplitude and taken as a percentage of the carrier amplitude.

Measurement	Units	Description
Sync/Bar (Rel 3/7)	%	The sync amplitude is divided by bar amplitude, then taken as a percentage of the nominal ratio, 3/7. If bar amplitude could not be determined, the nominal bar amplitude (700mV) is used.
Sync to Bar Top	mV	The difference in voltage levels between burst center and the Luminance Bar Reference is calculated. This amplitude is then added to the sync amplitude.
Pulse/Bar Ratio Err	% Bar	The difference between the 2T pulse amplitude and bar amplitude is computed as a percentage of the bar amplitude. If bar amplitude was not found, the nominal 700.0 mV is substituted. The result is positive if the pulse amplitude is greater. The pulse amplitude is the difference between the peak voltage level and the reference voltage level, where the reference value is computed as the averaged level at 1 µsec prior to and 1 µsec after the peak location.
2T Pulse K-factor	% Kf	The location of the pulse is defined by the 2T Sine- Square Pulse Center location in the Measurement Locations file. The maximum pulse ring is found by using the time-weighted CCIR K-Factor graticule.
C/L Gn Err (Mod Bar)	% Bar	This is the same as C/L Gn Err (Mod Pls) (see below), except in this instance the chrominance amplitude is found 3 µsec from the end of the Modulated Bar. The end of the bar is defined in the Measurement Locations file.
Chr/Lum Delay Ineq	ns	The luminance component and the chrominance component are separated out centered around the Modulated Pulse. The half amplitude duration (HAD) and Center location of the pulse as specified in the Measurement Locations file are used to determine the position and width of these components. The difference in the center locations of the luminance component and the chrominance component is the Chr/Lum Delay Ineq result.
C/L Gn Err (Mod Pls)	% Bar	The bar amplitude is subtracted from amplitude of the chrominance component, and the result is taken as a percentage of the bar amplitude. If the bar amplitude was not found, the nominal bar amplitude (700 mV) is used.
Lum. Nonlin. Dist.	%	The input video looks like a series of peaks that corresponds to each transition in the Luminance Staircase. Each peak's amplitude is de fined as the voltage difference at the peak and at the reference level, which is prior to the first transition by 1/2 the width of the 1st and 2nd transition. The minimum peak amplitude is subtracted from the maxi-mum amplitude and taken as a percentage of the maximum amplitude.

Measurement	Units	Description
Chrom Ref Ampl Err	%	Measured as the difference between the peak-to-peak amplitude of the colour subcarrier on the blanking tread of the modulated step wedge and its normalized value (40% of the luminance bar amplitude), expressed as a percentage. The sign of the difference is positive if the amplitude of the colour subcarrier on the blanking level tread is larger than the normalized value. (CCIR Rec. 569 2, Sect. 2.19).
Pk-Pk Diff Gain	%	The chrominance amplitude of each packet is found by looking at the four cycles centered in the middle of each packet. The minimum and maximum of these amplitudes are found and are taken as a percentage of blanking packet amplitude. Unity is then subtracted from each. The Pk-Pk Diff Gain is the sum of the absolute values of these.
Peak Diff Gain	%	The greater of the two absolute values as determined in the previous line.
Pk-Pk Diff Phase	Deg	The phase of each packet relative to the blanking packet is found and adjusted for the phase rotation in PAL. The sum of the absolute values of the minimum and maximum phase is the Pk-Pk Diff Phase.
Peak Diff Phase	Deg	The greater of the two absolute values as determined in the previous line.
Chr/Lum Intermod	% Bar	The voltage difference between the chrominance reference level and the luminance reference level as a percentage of the bar amplitude. The chrominance reference level is averaged over 4 cycles centered around 3 µsec from the end of the Modulated Bar. The luminance reference level is averaged over 4 cycles centered around the Modulated Bar Lum-Reference as defined in the Measurement Locations file. If bar amplitude was not found, the nominal value (700 mV) is used. The result is positive if the chrominance reference level is greater.
Sync Amplitude	mV	The difference in voltage levels between the center of sync and the center of burst.
Measurement	Units	Description
Sync Ampl Error	%	The difference between sync amplitude and the nominal sync amplitude (300.0 mV) is taken as a percentage of the nomimal. The result is positive if the actual sync amplitude is greater.

Measurement	Units	Description
Residual Carrier	% Carr	A new bar level is computed by finding the offset between burst center levels at the Zero Carrier Pulse line and the Luminance Bar line. This new bar level is then referenced to the Zero Carrier Pulse Center level. The difference in the voltage levels is taken as a percentage of the carrier amplitude.
Sync-to-Burst Start	µs	The 50% leading edge of sync is found precisely. The 50% leading edge of burst is found by finding the burst envelope first, then locating the 50% leading edge of the envelope. Sync-to-Burst Start is the timing difference between these two leading edges.
Burst Duration	µs	The timing difference between the 50% leading edge and 50% trailing edge on the burst envelope in µsec.
Burst Duration	Cycles	The timing difference between the 50% leading edge and 50% trailing edge on the burst envelope in subcarrier cycles.
Burst Amplitude	m V	The chrominance amplitude at burst center, averaged over 4 subcarrier cycles.
Burst Ampl Error	%	The nominal burst amplitude (300 mV) is subtracted from the burst amplitude. The result is divided by the nominal burst amplitude. If the actual burst amplitude is the greater of the two, the result is positive.
Burst Ampl Diff	%	For this measurement, and the Quadrature and SCH Phase of the next two lines, a reference subcarrier is generated at the precise 50% leading edge of sync for each line. The phase of the reference subcarrier is calculated such that the phase will be zero at line 1 of the first field of the colour frame. Note that this is the 50% edge found on the individual line, and not the average 50% edge. The Differential is the difference in chrominance amplitude of the +V and -V bursts as a percentage of the greater of the two values.
Burst Ampl Diff	%	For this measurement, and the Quadrature and SCH Phase of the next two lines, a reference subcarrier is generated at the precise 50% leading edge of sync for each line. The phase of the reference subcarrier is calculated such that the phase will be zero at line 1 of the first field of the colour frame. Note that this is the 50% edge found on the individual line, and not the average 50% edge. The Differential is the difference in chrominance amplitude of the +V and -V bursts as a percentage of the greater of the two values.
Burst Quad Error	Deg	The burst phase relative to the reference subcarrier is found for the +V and -V bursts. The difference between the relative +V and -V phases is found. The Quadrature value is the nominal difference (90 Deg) subtracted from the actual difference.
SCH Phase	Deg	The average of the relative +V and -V burst phase is found. The phase difference from burst center to reference subcarrier center is subtracted from this value. This result is brought back into a range of ±90 ° if Bruch Blanking was found, or ±45 Deg if Bruch Blanking was not found.

Measurement	Units	Description
Sync Duration	µs	The timing difference between the 50% leading edge of sync and 50% trailing edge of sync.
Sync Rise Time	ns	The timing difference between the 90% and 10% leading edge of sync.
Sync Fall Time	ns	The timing difference between the 90% and 10% trailing edge of sync.
Front Porch	µs	The timing difference between 50% leading edge of sync and the location where 330 mV is reached after sync.
Line Blanking	µs	The timing difference before and after sync where 330 mV is reached.
Broad Pulse Sep	µs	The worst deviation from the nominal half amplitude duration (4.7 µsec) of the broad pulses.
Equalizing Pulse	µs	The worst deviation from the nominal half amplitude duration (2.35 µsec) of the equalizing pulses.
Multiburst Flag	% Bar	The voltage difference between the center of the first two transitions and the center of the last two transitions of the flag. This is taken as a percentage of bar amplitude. If bar amplitude was not found, the nominal value (700 mV) is used. The location of the flag is defined in the Measurement Locations file as Multiburst Flag Start and Multiburst Flag Width.
Multiburst Flag	mV	The voltage difference as found in the previous line.
MB Packet #1 - #6	% Flag	The location of each packet is defined in the Measurement Locations file as Multiburst Packet Center (Time Offset from leading edge of flag). The amplitude of each packet is determined and taken as a percentage of the flag amplitude.
CCIR LF Error	% Bar	Measured as the peak-to-peak amplitude of the most extreme sampled fluctuations of the back porch from black level in the frequency band from 10 Hz to 2kHz, expressed as a percentage of bar amplitude. (Rec. 569-2, Sect. 2.17).
50-550 Hz LF Error	% Bar	Measured as the peak-to-peak amplitude of the most extreme sampled fluctuations of the back porch from black level in the frequency band from 50 Hz to 550 Hz, expressed as a percentage of bar amplitude. NOTE: The filter used in this LF error measurement has a +8 db gain at ~200 Hz, and therefore may show higher LF amplitude than the other LF error measurements.
10-1000 Hz LF Error	% Bar	Measured as the peak-to-peak amplitude of the most extreme sampled fluctuations of the back porch from black level in the frequency band from 10 Hz to 1000 Hz, expressed as a percentage of bar amplitude.

In Auto mode, version 2.05 and later software performs two types of signal-to-noise measurements: S/N and S/N.2, in the Auto display and the Auto measurement results file.

The VM700A performs S/N measurements by combining the lines being measured, then fast-Fourier transforming and filtering them. In contrast, S/N.2 measurement lines are

individually fast-Fourier transformed, the energy spectra are combined, and the result is filtered (there is no S/N.2 Periodic measurement).

S/N measurements let you determine whether or not periodic signals are present at the cost of magnifying the effects of correlated noise (in other words, all noise is treated as random, when in fact, it may be non-random, or correlated). S/N.2 measurements are more effective at removing correlated noise; these may provide a "truer" measurement if you suspect that correlated noise is present.

Measurement	Units	Description
S/N or S/N.2 Unweighted (567)	dB	Defined as the ratio of the luminance bar amplitude to the rms value of the noise measured on the Quiet Line (as specified by the current Measurement Locations File), expressed in dB. The measurement bandwidth is limited by a 5-MHz low-pass filter, and by "implicit" 15-kHz high-pass filtration caused by the sampling. The VM700A does not need to use the alternative high-pass filter specified in CCIR Rec. 567-2, Sect. C.3.2.1. In the rare event that there is a large amount of noise between 10 and 15 kHz, this "insertion" measurement (made on a single line) will differ from what the measurement would be if made on a flat field.
S/N or S/N.2 Lum-wgtd (567)	dB	Defined as the ratio of the luminance bar amplitude to the rms value of the noise measured on the Quiet Line (as specified by the current Measurement Locations File), expressed in dB. The measurement bandwidth is limited by a 5-MHz low-pass filter, and by "implicit" 15-kHz high-pass filtration caused by the sampling,the output of which is then weighted by the unified weighting network specified by the CCIR in Rec. 567. The VM700A does not need to use the alternative high-pass filter specified in CCIR Rec. 567-2, Sect. C.3.2.1. In the rare event that there is a large amount of noise between 10 and 15 kHz, this "insertion" measurement (made on a single line) will differ from what the measurement would be if made on a flat field.
S/N or S/N.2 Chr-wgtd	dB	Measured as the ratio in dB of bar amplitude to the chrominance-weighted rms amplitude of the noise on the Quiet Line (as specified by the current Measurement Locations File). The chrominance weighting filter is as specified in Annex I to CCIR Rep. 637-3.
S/N Periodic	dB	Measures line-related noise (cross-talk from signal channels, residual subcarrier, etc.) on the Quiet Line (as specified by the current Measurement Locations File). The measurement bandwidth is limited by a 5-MHz low-pass filter, and by "implicit" 15-kHz high-pass filtration caused by the sampling.

Measurement	Units	Description
S/N or S/N.2 Unweighted (569)	dB	Defined as the ratio of the luminance bar amplitude to the rms value of the noise measured on the Quiet Line (as specified by the current Measurement Locations File), expressed in dB. The measurement bandwidth is limited by a 200-kHz high-pass filter and a 5-MHz low-pass filter. (Rec. 569-2, Sect. 2.15.1).
S/N or S/N.2 Lum-wgtd (569)	dB	Defined as the ratio of the luminance bar amplitude to the rms value of the noise measured on the Quiet Line (as specified by the current Measurement Locations File), expressed in dB. The measurement bandwidth is limited by a 200-kHz high-pass filter and a 5-MHz low-pass filter, the output of which are then weighted by the unified weighting network specified by the CCIR in Rec. 567. (Rec. 569-2, Sect. 2.15.2).
ICPM (Absolute)	Deg	The Zero Carrier Pulse line and the Luminance Staircase lines are summed separately from the video input and the quadrature input. The four resulting arrays are measured (where appropriate) at the following locations: sync center and burst center of the Luminance Staircase line, the center locations of each of the steps of the Luminance Staircase line, and burst center and Zero Carrier Pulse center of the Zero Carrier Pulse line. Sixteen samples are averaged, centered at each of these locations. The results at these locations from the video input and the results from the quadrature input are kept separate. The zero carrier center values are then subtracted from the luminance values in both sets. XY phase pairs are then formed from the inverse of video results and quadrature results. The angles from these XY pairs are found. The maximum deviation from 0 is the absolute ICPM. If SIS is present, the value at sync bottom is ignored in finding the maximum departure.
ICPM (Rel Blanking)	Deg	The angles from the XY pairs are found as in the previous line. The angle at back porch on the Luminance Staircase line is subtracted from each. The maximum departure is then found as in the previous line.
Field Time Dist	%	For each line, the voltage difference (amplitude) between blanking level and the center of the line is found. This results in an array which is used to locate the beginning, center, and end of the field square wave. The field square wave must be greater than 90 lines and less than 220 lines in width to be valid. The voltage level at the center of the square wave is then used as the reference level. Ignoring the first and last four lines of the square wave, the maximum voltage deviation from the reference level is found. This deviation is then taken as a percentage of the amplitude at the center of the square wave.

Section 4
PAL MEASUREMENT SPECIFICATIONS

This chapter lists the specifications for each PAL measurement.

All accuracies shown for measurements with averaging capabilities assume the default averaging factor of 32.

All accuracies shown for measurements with "relative mode accuracy" assume an averaging factor of 256 was used to create the reference.

MEASURE MODE

Table 4-1
Bar Line Time

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

Bounce

Table 4-2
Bounce

Measurement	Range	Accuracy
Peak Deviation	0 to 50%	±1%
Settling Time	0 to 10 sec	±100 msec

Burst Frequency

Table 4-3
Burst Frequency

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

Chrominance to Luminance

Table 4-4
Chrominance to Luminance

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

Chrominance Noise

Table 4-5
Chrominance Noise

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

Chrominance Non-Linearity

Table 4-6
Chrominance Non-Linearity

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Chrominance Amplitude	0 to 100%	±1.0%	±0.5%
Chrominance Phase	0 to 360°	±1°	±0.2°
Chrominance to Luminance Intermodulation	–50 to +50%	±0.2%	±0.2%

Color Bar

Table 4-7
Color Bar

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

Differential Gain and Phase

Table 4-8
Differential Gain and Phase

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

Frequency Response and Group Delay

Table 4-9
Frequency Response and Group Delay

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

Horizontal Blanking

Table 4-10
Horizontal Blanking

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

Horizontal Timing

Table 4-11
Horizontal Timing

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

Incedental Carrier Phase Modulation

Table 4-12
Incedental Carrier Phase Modulation

Measurement	Range	Accuracy
ICPM (requires zero Carrier Pulse and the quadrature output of the demodulator on Channel C)	0 to 90°	±1.0°

Jitter

Table 4-13
Jitter

Measurement	Range	Absolute Mode Accuracy
Jitter (2 Field)	±20 ms	±10 ns
Jitter Long Time	±20 ms	±10 ns

K-Factor

Table 4-14
K-Factor

Measurement	Range	Absolute Mode Accuracy
2T Pulse K-Factor	0 to 10% Kf	±0.3%
K_{PB}	–10 to +5% K_{PB}	±0.3%
Pulse to Bar Ratio	10 to 125%	±0.7%
Pulse Half Amplitude Duration (HAD)	100 to 500 ns	±5 ns

Line Frequency

Table 4-15
Line Frequency

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

Luminance Non-Linearity

Table 4-16
Luminance Non-Linearity

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Luminance Non-Linearity	0 to 100%	±0.4%	±0.2%

Multiburst

Table 4-17
Multiburst

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

Noise Spectrum

Table 4-18
Noise Spectrum

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

SCH Phase

Table 4-19
SCH Phase

Measurement	Range	Absolute Mode Accuracy
SCH Phase	±90°	±5°

Vertical Blanking

Table 4-20
Vertical Blanking

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

AUTO MODE

Line Blanking Timing Measurements

Table 4-21
Line Blanking Timing Measurements

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

Field Blanking Timing Measurements

Table 4-22
Field Blanking Timing Measurements

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

Other Timing Measurements

Table 4-23
Other Timing Measurements

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

Amplitude and Phase Measurements

Table 4-24
Amplitude and Phase Measurements

Measurement	Range	Accuracy	ITS Element	Standard
Average Picture Level	0 to 200%	±3%		
Sync Amplitude Error	+100 to –50% (300 mV nominal)	±0.3% of nominal	Live picture area	CCIR Rec. 569
Sync Amplitude Error (with Sound-in-Sync)	+100 to –50% (300 mV nominal)	±0.3% of nominal	Last broad pulse in field	CCIR Rec. 569
Burst Amplitude Error	+80 to –50% (300 mV nominal)	±1.0%	Live picture area	CCIR Rec. 569
Chrominance Reference Amplitude Error	–80 to +50% (300 mV nominal)	±1.0%	D2	CCIR Rec. 569
Luminance Bar Amplitude Error	±30 to –70% (700 mV nominal)	±0.3%	B2	CCIR Rec. 569
Luminance Bar Amplitude	200 to 900 mV	±2.2 mV	B2	
Luminance Bar Amplitude (% of carrier)	0 to 90% of Maximum Carrier	±0.3%	B2 and Zero Carrier	
Residual Carrier (Bar Top)	0 to 90% of Maximum Carrier	±0.3%	B2 and Zero Carrier	
Blanking Level	0 to 90% of Zero Carrier	±0.2%	Live picture area	CCIR Rep. 624-1
Chrominance-Luminance Gain Inequality	±75% of bar amplitude	±1.0%	G1 or G2	CCIR Rec. 569
Chrominance-Luminance Delay Inequality	±300 ns (0 ns nominal)	±5 ns	F or G1 or G2	CCIR Rec. 569
Sync/Bar Rel. 3/7	20 to 110%	±0.5%	B2	CCIR Rec. 569
Sync to Bar Top	0.5 to 2 V	±0.5%	B2	CCIR Rec. 569
C/L Gn Err (using modulated Pulse)	±50%	±1%	F	
Sync Amplitude	75 to 600 mV	±2.1 mV		
Burst Amplitude	75 to 600 mV	±3 mV		
Burst Amplitude Difference		±2%		
Burst Quadrature Error		±1°		
Differential Gain (Peak and p-p)	0 to +100% (0% nominal	±0.3%	D2	CCIR Rec. 569
Differential Phase (Peak and p-p)	0 to 360° (0° nominal)	±0.3°	D2	CCIR Rec. 569

Frequency Response Measurements

Table 4-25
Frequency Response Measurements

Measurement	Range	Accuracy	ITS Element	Standard
Multiburst Flag Amplitude	20 to 130% of bar (60% nominal)	±0.5%	C1	CCIR Rec. 567
Multiburst Amplitude	0 to 200% of flag (100% nominal)	±1.5% of flag (±2.5% of 5.8 MHz packet)	C2	CCIR Rec. 567

Waveform Distortion Measurements

Table 4-26
Waveform Distortion Measurements

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

Low Frequency Error

Table 4-27
Low Frequency Error

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

Noise Measurements

Table 4-28
Noise Measurements

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

Incidental Carrier Phase Modulation

Table 4-29
Incidental Carrier Phase Modulation

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

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VM700A OPT 11 Problem Report Form

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Firmware Version (found on rear of instrument):

Hardware Version (found on rear of instrument):

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