

LEADER

TELEPRODUCTION TEST



VOLUME 2 NUMBER 1



NTSC/PAL/SECAM WAVEFORM MONITOR

Waveform monitors and vectorscopes, the basic and familiar video monitoring tools, have recently undergone a massive infusion of new capabilities, due largely to microprocessor control. Hence, it's time to take a closer look at just what the newer units can do for you. For illustration, Leader's new 5222 Waveform Monitor and 5212 Vectorscope will be shown. Since these units are equally at home in NTSC and PAL (the 5222 also handles SECAM), it will be an opportunity to look at these formats in comparison.

5222 Waveform Monitor

It's reassuring that the front panel has changed

little from the waveform monitors that have been covered in previous issues of Teleproduction Test. See Figure 1-1. Some new controls that we'll check out, but much of the operational power remains behind the scenes ready to be accessed via microprocessor memory. Figure 1-2 shows a menu index called up by holding the MENU key in for a second.

The INPUT selectors show a major change. There are four input selectors accompanied by the A/B selector below the CH4 key. Thus eight signals may be monitored, A and B groups of four each. These signals may be selected individually or in selected groups making the 5222 fully



Fig. 1-1 Front panel of Leader's multi-standard 8-channel waveform monitor, Model 5222.

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Figure 1-2 Main menu called up by pressing and holding the MENU key for one second.

operational in both composite, Y/C and component facilities. Figure 1-3 shows an example of four channel operation using a component feed of GBR into CH1, 2 and 3 and a composite feed from a genlocked source into CH4. The system is NTSC (525/60) and the DISPLAY key in the SWEEP group has been set to illuminate PARADE. The four signals then appear side-by-side as shown. For this display a SYSTEM menu selection has been made for GBR operation. See Figure 1-4. This clamps G, B and R signals at the blanking level with the DC RESTorer operating. CH4, composite in this case, is also clamped at blanking set to the zero IRE line. (V centering must still be set to put signal blanking at zero IRE).

The display shown in Figure 1-3 has all four A inputs active. But the sweep adjusts automatically in the PARADE mode for the number of active channels. Thus three side-by-side waveforms appear for three channel component displays, or two side-by-side waveforms of a 2-channel display. It is also possible to overlay two component signals using CH1, 2 and 3 of both A and B inputs. Six is the maximum number of channels that can be accommodated in the overlay (ALT) mode.

Multichannel operation requires that a signal be designated as the sync reference. The choices are CH1 or CH4 from either the A or B inputs, as well as EXTERNAL reference. These choices are stepped through by pressing the REF SELECT key, and the selected reference appears at the lower left of the screen as shown in Figure 1-3.

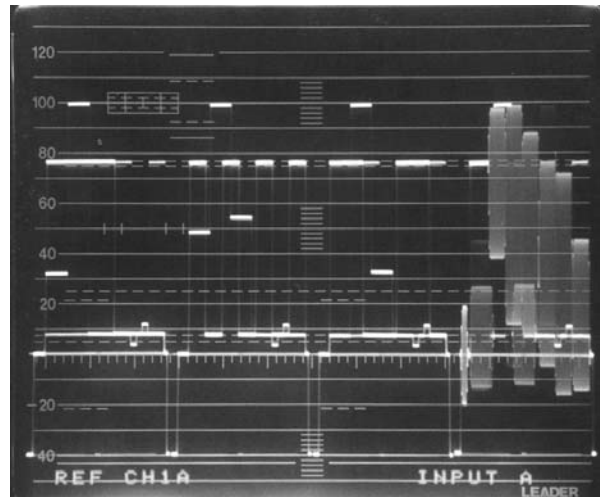


Figure 1-3 NTSC GBR waveforms on channels 1, 2 and 3, composite color bars on channel 4.

Interesting thing about the on-screen notices. They can be switched off by making a menu selection on the DISPLAY menu (READOUT OFF). However, even if you switch them off, they appear whenever panel changes are made that affect the reading. For example, the sync reference would appear as the selection is made and REF CH1A would remain if that channel is selected. But if READOUT OFF is selected, the notice will disappear in six seconds.

Figure 1-5 shows PAL color bars in Y, Pb, Pr component form with a composite PAL signal on CH4. The 5222 switches automatically to handle 625/50 (PAL or SECAM III), although the selection 525/60 or 625/50 may be manually selected from the SYSTEM menu. The component signal is from the Leader Model 408NPS generator which has Y, B-Y, R-Y output jacks. It is important, however, to switch off burst from the front panel of the 408NPS or burst will remain in terms of V and U components at the normal burst location.

A voltage scale at the right edge of the waveform display comes on automatically in PAL/SECAM modes to indicate +0.7V and -0.3V. Voltage readouts normal practice in Europe, but a scale similar to IRE scale at the left is read out in percentage (0.7V = 100%). Sync tip at -0.3V translates into -42.86%. The graticule line just below -40 IRE marks ---- 42.86% or -0.3V ---- for correct sync amplitude. Two pairs of dashed lines that straddle zero at $\pm 21.43\%$ mark the correct -0.3V p-p for PAL burst. You will note that subcarrier, including burst, on PAL signals



Figure 1-4 System menu. Note that AUTO has been selected for NTSC/PAL/SECAM and that GBR has been chosen for signal FORMAT.

appears “smeared out” unlike the individual cycles of subcarrier we are used to with NTSC. That’s because subcarrier is an odd multiple of half the H frequency in NTSC. The same is true for PAL, but a 16 Hz offset has been added to minimize the dot pattern caused by subcarrier signals on monochrome TV sets. It’s this offset that causes subcarrier to appear smeared out. The SYSTEM selection for Figure 1-5 has also been menu selected for Y, Pb, Pr operation. This places B-Y (CH2) and R-Y (CH3) on a 350 mV pedestal so that the color-difference signals span the active video area between zero and 100% (zero and 100 IRE for NTSC).

System Timing

Pressing the WFM and PIC keys in the MODE group (refer back to Figure 1-1) activates the component TIMING display. This automatically

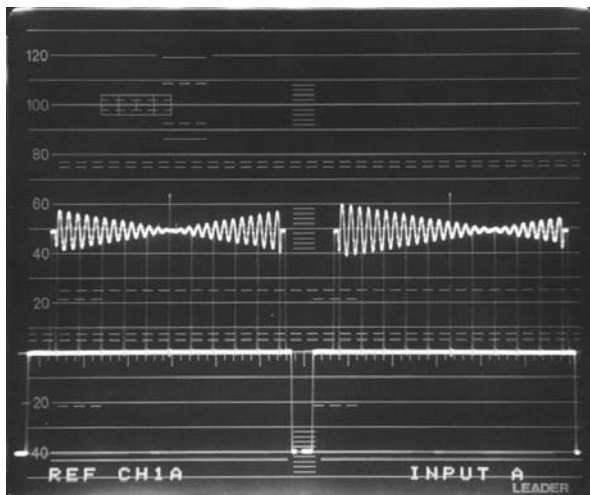


Figure 1-6 Timing operation using Bowtie signal to check timing of Y/B-Y (left) and Y/R-Y (right).

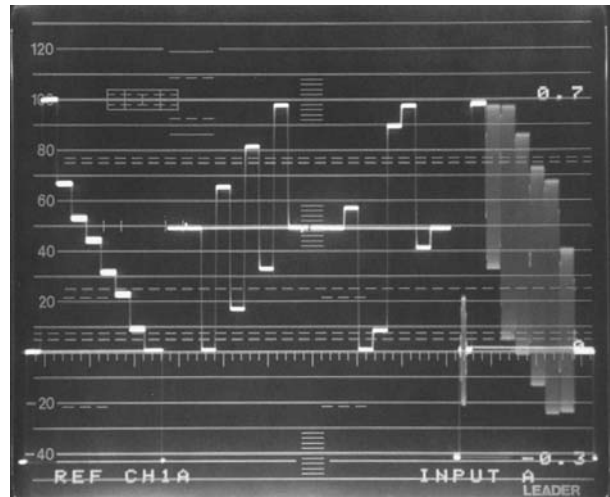


Figure 1-5 PAL component signal in Y, Pb, Pr form plus composite signal on CH4. Voltage scale at right denotes 625/50 signal.

activates CH1, 2 and 3 and inverts CH2 (B-Y) and CH3 (R-Y) to add to Y using a 2H sweep. The BOWTIE signal results in the display shown in Figure 1-6. Here error between Y and B-Y appear as a shift in the “knot” of the bowtie to left or right of the central marker in the left hand waveform. The right hand waveform shows the timing error between Y and R-Y. An error of about 300 nanoseconds appears between Y and R-Y in the figure (R-Y late). Each small marker represents 200 nanoseconds.

Y/C Operation

Separate luminance and chrominance can be monitored in the conventional sense as shown in Figure 1-7. Here Y is applied to CH1 and C to CH2 with the 5222 set in the parade mode with the same 350 mV pedestal that is added to CH2 for Y, Pb, Pr use (refer back to Figure 3). This

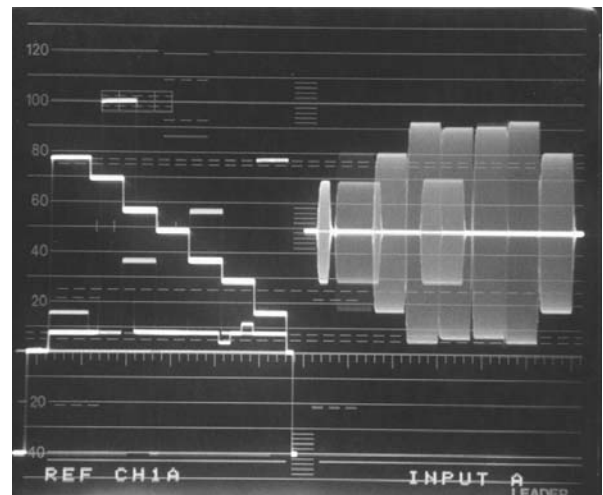


Figure 1-7 Y/C signal in two channel operation, parade mode.

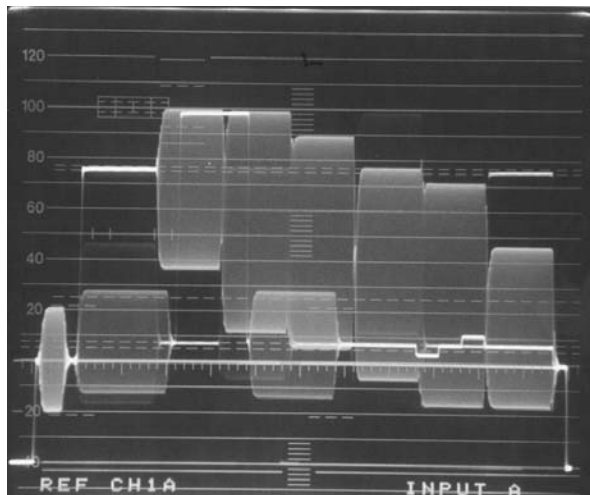


Figure 1-8 Y/C signal in Y/C mode reconstructs composite signal for display from Y/C components.

display is somewhat unfamiliar; we may not be sure how to gauge chrominance amplitude, for example. But the 5222 solves this problem by selecting Y/C operation from the SYSTEM menu. In this case, Y (CH1) and C (CH2) are added internally to form the composite waveform. See Figure 1-8. Here the familiar aspects of SMPTE or EIA bars can be put to use. For example, the chroma tips of the yellow and cyan bars show touch the 'built-in' gauge formed of the 100% white bar to verify correct chroma to luminance ratio. Thus we can monitor Y/C using the composite waveform and still be sure that separate Y and C are correct.

Picture Display

Pressing the PIC key on the front panel alters the 5222 to become a picture monitor for the

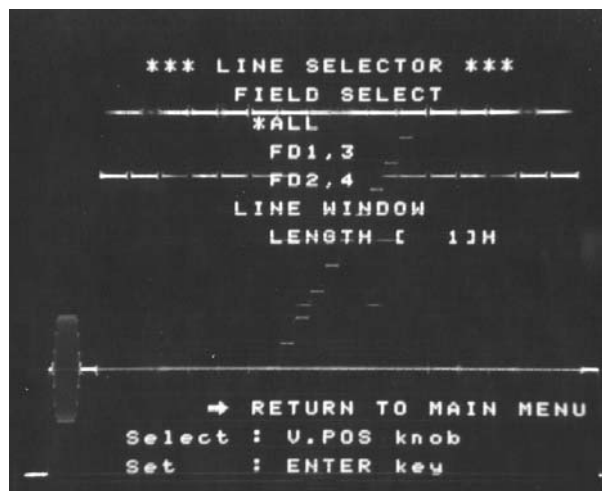


Figure 1-10 Line selector menu includes a variable window for multiple lines.

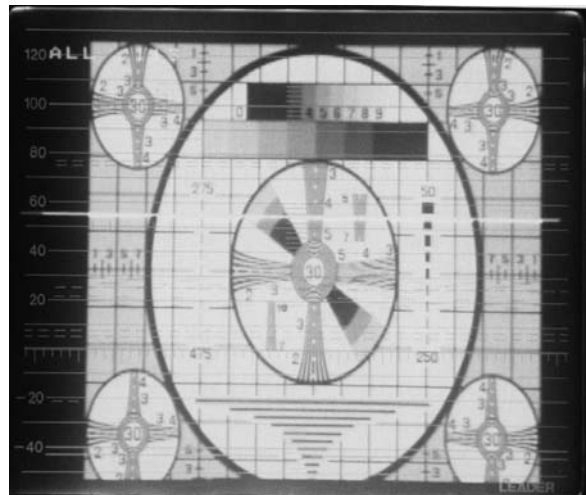


Figure 1-9 Picture display of monoscope signal. The horizontal line is the line-select strobe.

selected input. This is extremely useful in identifying program content to reinforce the operator's knowledge that a particular feed is indeed carrying the correct signal. Figure 1-9 shows the picture display for a monoscope signal from Leader's 435B generator. Note that the picture is almost square. Picture width is the same as the active display (between blanking edges) in the 1H waveform and picture height has been set for maximum display area. But, as you can see, picture quality is more than adequate to spot picture content. (A white phosphor is available for the 5222 as well). A particular advantage comes up in LINE SELECT operation. Figure 1-9 shows a bright horizontal line to highlight the selected line. It has been set in this case to pass through the upper resolution wedge at about 350 lines and 600 lines in the Hi Res wedge to the right.

Line Select

Line select operation functions for all the lines in the raster, those blanked in the vertical interval as well as all active lines. Press the LINE SELECT key to activate. Selected line number appears at the upper left of the screen and automatically adapts to 525/60 or 625/50 standard notation (1-263 for each field in NTSC or 1-625 in the line numbering system used for PAL).

Figure 1-10 shows the LINE SELECTOR menu. The FIELD SELECT choices offers the choice of ALL (lines N for Field 1 and 2) or restriction to a single line in either Field 1 (and 3) or 2 (and 4). A remarkable new choice is offered UNDER LINE WINDOW LENGTH. Normally in line select operation the choice applies to a single line. But in the 5222 the WINDOW can be set to

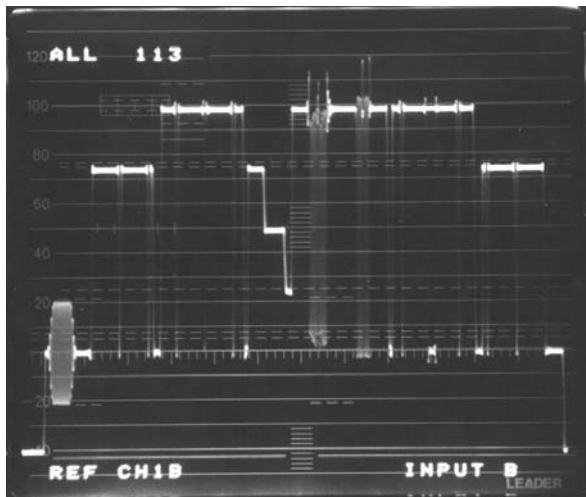


Figure 1-11 Waveform of the line selected in Figure 1-9 (lines 113 of Fields 1 and 2).

any number of lines. This increases brightness if the window is set, for example, to open the number of lines to span the height of a particular band in a matrix test pattern.

An example of the use of line select in the active part of the picture is shown in Figure 1-9. Here the LINE SELECT key was touched while the PICTURE display was in use. Then the V POS/REF knob was adjusted to place the highlighted lines at the point where they cross the top-center resolution wedge of the monoscope pattern at 450 TV lines. Note that if ALL is selected for FIELD SELECT and the LINE WINDOW is one line, you will be looking at two lines. In this case, lines 113 of Fields 1 (3) and 2 (4). Pressing WFM calls up the waveform of those lines. See Figure 1-11. The partial staircase is formed where the lines cross through part of the diagonal four step gray scale to the upper left quadrant. In the center of the waveform is a burst of sine waves for 450 TV lines (5.6 MHz). And to the right of this burst another where the selected lines pass through 600 TV lines (7.5 MHz) of the resolution wedge in the upper right quadrant. An example of line selection during the vertical blanking interval will be shown in Figure 1-18.

It's worth noting that full control access remains in the line-select mode. That is, you can magnify the waveforms in both level and time dimensions and have full access to cursor operations.

CAL

In earlier waveform monitors, calibration signals have been square waves of set amplitude to check V gain. In the 5222 pressing REF SET/CAL and holding for one second calls up a cursor-

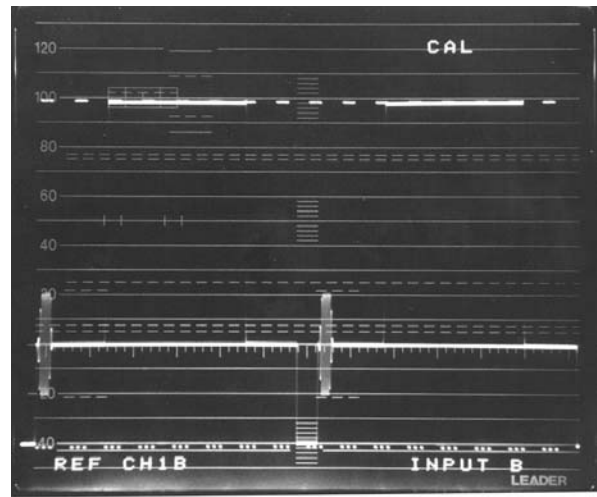


Figure 1-12 CAL signal superimposes precise 140 IRE cursors over observed waveform.

line display. See Figure 1-12. The CAL signal spans precisely 1V p-p or 140 IRE and is superimposed over the signal being observed. Thus it forms a form of gauge for setting signal amplitude as well as checking calibration. Vertical position of the CAL span is set by the V POS knob with the CURSOR key lighted.

CURSORS

The use of cursors permits fast, accurate readings of video levels and time. And by presetting the cursors convenient gauges can be set up for adjusting signal levels or time spans. For example, a "bar digh" setting is often called for in camera encoder adjustments. This is easy if you preset the time cursors to the bar width given in the manual and then set camera bar width to fit. But the real power of cursor measurements in the

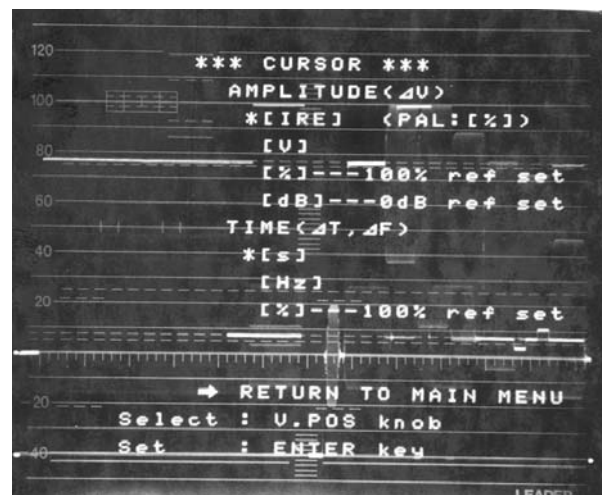


Figure 1-13 Cursor menu offers a choice of engineering units for both level and time (frequency)

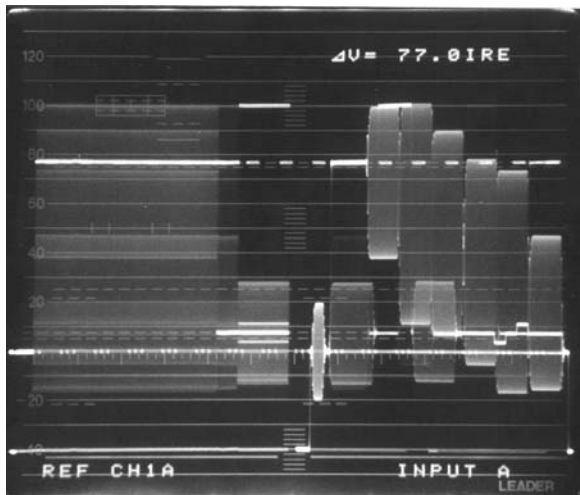


Figure 1-14 1V/1H combination time base with 77 IRE cursors aligned over 75% white bar of the SMPTE bar pattern.

5222 is shown by the CURSOR menu in Figure 1-13. First you can see that you have a choice of engineering units for level: IRE units (% for PAL) or V (reads in mV below one volt). Figure 1-14 shows an IRE readout of the level of the 75% white bar in SMPTE bars. Due to the effects of setup, this bar is correct at 77 IRE.

Voltage ratios can be expressed in either % or dB. Figure 1-15 shows an example of ratios in dB. Here a 5 MHz field-rate sweep from the 408NPS is applied to the 5222 which has been set for a 2 V display with FLAT (left) and LUMInance (right) filter selected. For dB measurements a reference must be established. In this case, the cursors were placed to span the top half (center to top) of the flat sweep envelope. Then REF SET is pressed to establish the reference. A reading of 0.00 dB results. Then, in this case, the delta

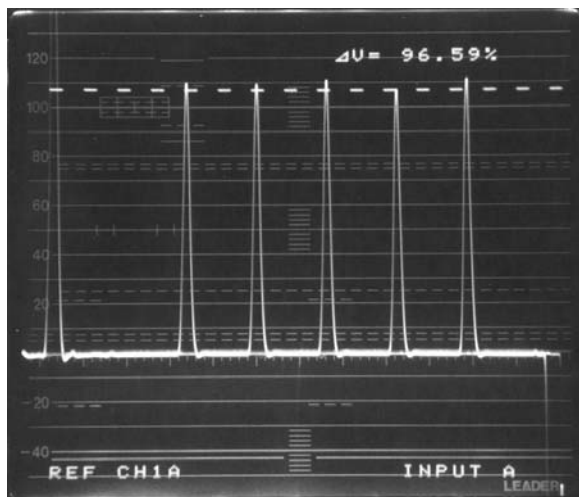


Figure 1-16 Percent cursors used to measure luminance nonlinearity.

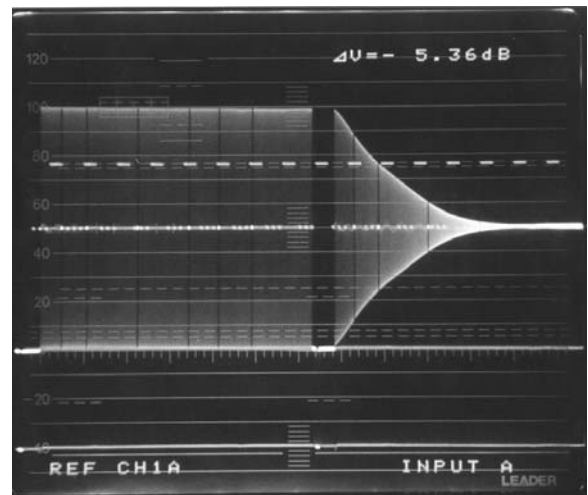


Figure 1-15 Use of dB cursors to measure voltage ratios involves a two step procedure: set reference and measure.

cursor was adjusted to cross the sweep at the 1 MHz dropout marker. The readout shows response down 5.36 dB at 1 MHz. The same scheme can be used to measure insertion loss and other ratios.

Use of ratio in percentage is shown in Figure 1-16. Here a 5 step staircase signal applied through a VCR AGC stage is used to measure luminance linearity. The 5222 is set for the DIF STEP (differentiated step) filter which differentiates the risers on the waveform to form spikes. Cursor span was set for the largest spike and REF SET pressed for a 100% reading. Then the delta cursor was lowered to the shortest spike for a reading of 96.5%; a luminance non-linearity of 3.5%.

Time cursors can be set for μ s (ms for V rate observations). And these adjust automatically for the time base in use, including MAG. Figure 1-18 shows the time cursors used to measure the gray pedestal on the VIRS signal. The choice of level or time cursors is made by touching the $\Delta V/\Delta T$ key; the sequence is ΔV , ΔT , cursors off.

Presets

Presets are huge time savers. In essence, you can adjust the 5222 for a very complex observation and assign a preset number to it. When that number is recalled, the instrument returns to all the settings you had made including channel selection, mode, filter choice, time base, sweep mode, cursor settings ---- even the settings of the variable gain control and the H and V FOCUS, scale illumination trace rotation and POWER ON-OFF. And it's very easy to do. Simply

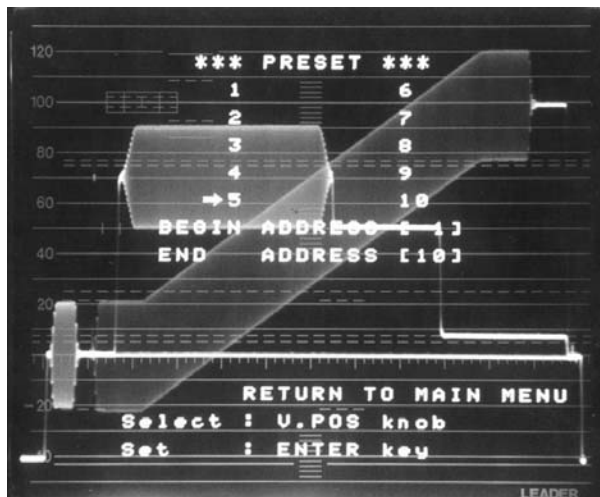


Figure 1-17 PRESET menu allows numbers 1-10 to be assigned to any give instrument setup.

make all your set up adjustments for a particular observation, call the PESET menu (Figure 1-17), and assign the preset number of your choice. In this case, the arrow was placed opposite 5 to assign that number to the setup. To recall 5, simply press RECALL repeatedly until RECALL 5 appears at the top-left of the screen. See Figure 1-18. The 5222 had returned to a line select situation wherein line 18 of both fields was recalled. In this case, the line select window had been set to two lines so that ines 18 and 19 appear superimposed. Cursors had been set as shown and are part of the recall memory.

An internal, rechargeable battery maintains microprocessor memory for recall purposes. This battery backup is also responsible for returning the insturment to the way it had been set up before power was shut down.

DC Restorer

The 5222 uses a conventional back porch clamp (dc restorer) to amintain blanking level settings despite changes in signal average picture level. A front panel switch permits the clamp to be disabled so that lower frequency tilt and/or hum can be inspected. In older waveform monitors, changes in the characteristics of the dc clamp could be made only actual wiring changes. Such changes have been made to alter the time constant of the filter, for example. In the 5222, changes can be made by simply calling up the DC RESTORER menu. See Figure 1-19. Here the time constant of the filter can be altered from SLOW to FAST. In addition, the timing of the clamp pulse can be altered. This is shown by a

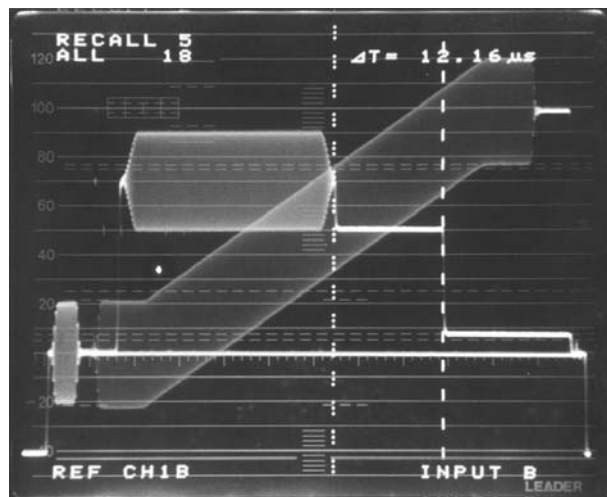


Figure 1-18 Preset 5 recalled. In this case, a setup involving line select with a two-line window to show lines 18 and 19 of both fields superimposed.

highlight on the waveform to show both the timing and time span of the clamp pulse. the pulse can be moved from the trailing edge of sync to well into the active video area.

Remote Control

The 5222 offers a number of remote control functions. Among these is the ability to control the 5212 vectorscope from the 5222. This is done by a single 9-pin cable interconnect between the 5222 and the 5212. The cable is supplied with the 5212. To set up the 5222 the REMOTE menu is selected from the main menu, and REMOTE ON is selected. This sets up the 5222 for remote control and the state is put into effect by pressing the WFM key for one second. Thereafter, the vectorscope will follow the waveform monitor in terms of channel selection (1-3), preset and

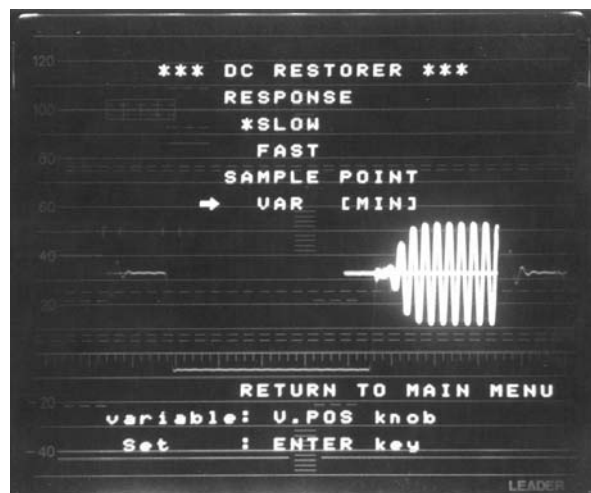


Figure 1-19 DC RESTORER menu allows the time constant of the clamp filter to be altered as well as the timing of the clamp pulse.

preset recall. During line select operations, the vectorscope shows the polar display for the selected line(s). Remote control to the 5222 (and the 5212) is effected by simple ground closures to designated pins on a 15-pin D sub connector on the rear panel. Among the remote control functions is recall of eight presets.

408NPS

Many of the signals used for the waveforms shown in this series have been provided by the Leader Model 408NPS generator. See Figure 1-20. The 408NPS is similar in most operating aspects to the popular Model 408. But the primary difference is that the NPS version is equally at home in NTSC, PAL and SECAM operations including VHF and UHF channel

assignments in use throughout the world, as well as applicable sound modulation. The very powerful features of the 408 remain in the 408NPS. These include 22 test patterns, programmability of video parameters, channel selection, full range setability of video carrier (with 10 kHz resolution), genlock, wide and narrow field rate video sweeps with markers, multiburst with last burst variable to 15 MHz and the ability to store and recall 100 test setups. And simultaneous outputs of composite, Y, B-Y, R-Y, Y/C, GBR analog and GBR TTL, composite sync, composite blanking, H and V drive, burst flag and CW subcarrier offer all the signals likely to be required in composite, component and Y/C operations.



Figure 1-20 The 408NPS, an extremely versatile video/RF generator that operates in NTSC, PAL and SECAM systems.

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