Operator's Manual
SD385 NOMAD Portable Signal Analyzer
Part Two

Legacy Manual

COGNITIVE VISION, INC.
7220 Trade Street, Suite 101
San Diego, CA 92121-2325 USA

analyzers@cognitivevision.com
www.cognitivevision.com

Tel: 1.858.578.3778 / Fax: 1.858.578.2778
In USA: 1.800.VIB.TEST (842.8378)

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SERIAL _____

OPERATOR'S MANUAL

SD385
NOMAD
Portable
Signal Analyzer

Scientific-Atlanta
Spectral Dynamics Division
United States: P.O. Box 23575 • San Diego, CA 92123-0575 • (619) 268-7100 • TWX 910-335-2022

P/N 22120000
01-87-12-0011

Press AVERAGE STOP and select PK (peak) averaging by pressing SCROLL UP. Press START and vary the oscillator frequency. Peak average stores the highest encountered value of each frequency cell in the Average Memory. This is very useful for sine-sweep applications.

1-3.4 Using Cursor & Measurement Units Controls

After acquiring/processing signal data, the user will wish to take measurement readings, adjust the display for the best presentation, etc. Among the controls used to do this is the SEL TRACE button. This button is located in the lower left corner of the SCROLL group. Just to the left of this button are two LEDs. These LEDs indicate the trace/channel or traces/channels being displayed. Up to now, a dual display has been used so both LEDs have been lit. When the upper LED only is lit, upper trace data (if a single-channel, dual-trace type function is selected) or Channel A data (if a two-channel function is selected) is being displayed. If the lower LED is lit, then lower trace or Channel B data is being displayed.

Adjust the oscillator for an output of 3 kHz at 1V, and perform a Panel-Zero-Recall. Using the SCROLL group SEL TRACE button, select the upper trace for display by pressing the SEL TRACE button until the UPPR LED is the only one lit.

Press the SETUP ON/OFF button to display the Setup Pages and, using the PAGE ADV button, select Setup Page 4 (X & Y UNITS PAGE). Using the SETUP group UP/DOWN buttons, position the RV on the VERT WINDOW (LG) field.

This control determines the number of decades in a LOG Y display. Press the SCROLL DOWN button to select a 40 dB window and observe the trace. Press the SCROLL DOWN button again to select a 20 dB window and observe the effect on the trace. This feature allows detailed examination of data that has less variation in amplitude. Press the SCROLL DOWN button to select an 80 dB window. Press the SETUP ON/OFF button to exit the Setup Page display. Using the SETUP UP/DOWN/LEFT/RIGHT buttons, place the RV on DG (located on the top line of display annotation).

Press the SCROLL group MENU button to display the DISPLAY GAIN menu. Scroll through the menu and note that the Y-Axis Scaling changes with the Display Gain setting as shown in Figure 1-15. On the ENTRY keypad, Press 6 and ENT to return the DISPLAY GAIN setting to 0 dB. Press the MENU button to turn the menu off.

Press the Y UNITS FIELD LOCATOR button. Press SCROLL UP twice to select Volts (V) Y-AXIS UNITS. Press the SETUP DOWN button to position the RV on the Y-AXIS SCALING field. Press SCROLL UP to select Linear (LIN). Note the effect this has on the trace. Slowly decrease the oscillator output level until the displayed signal disappears. Press SCROLL UP to return to a Logarithmic (LOG) display. The signal should now be approximately one-half the screen height. Greater sensitivity and a wider range of measurement are advantages of logarithmic scaling. Adjust the oscillator for 1V.

Observe that the Y-Axis Scaling full scale number matches the input level as shown in Figure 1-15. Position the RV on the LVL A field and SCROLL UP to select an input level of 2V. Note that the Y-Axis full scale number changed to match the new input level. Press the Y UNITS FIELD LOCATOR button and SCROLL DOWN twice to select DB units. The Y-Axis full scale is now 0 (for 0 dB).

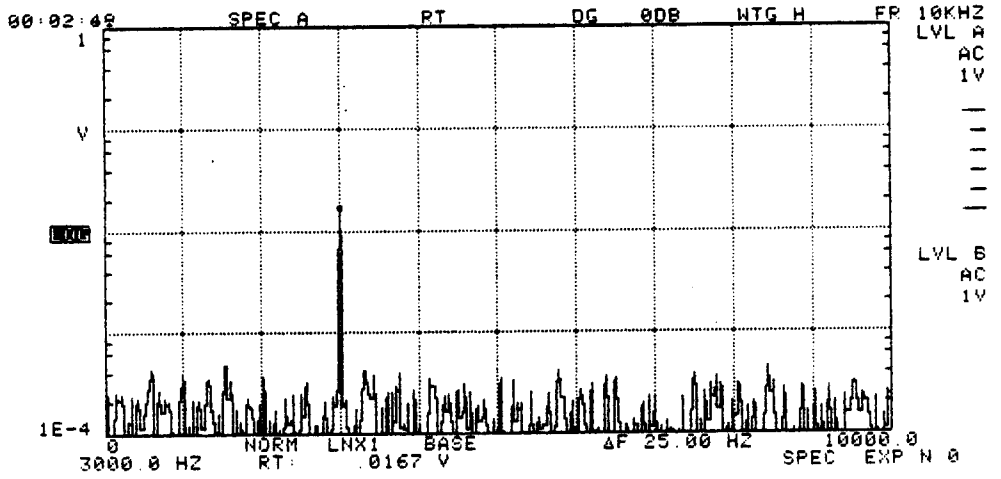


Figure 1-15. Y-Axis Full Scale Display

Press the SETUP RIGHT and MENU buttons. The selected menu item, COUNT-N, automatically stops the averaging process when the AVG TARGET COUNT is reached. When the AVG STOP ON is COUNT-N, Peak and Exponential averaging modes do not have the capability to automatically stop the averaging process. Selection of menu item 2 (TIME-T) provides this capability. Press the MENU button to remove the menu listing from the display.

Display the ACQUISITION PAGE and select the REPEAT (AMP) TRIG UPDATE MODE. Press the SETUP ON/OFF button to exit the Setup Page display.

An overload is indicated by the OVLD LEDs lighting up. These indicators are located in the lower left area of the front panel. Increase the output level of the oscillator until an overload occurs. Press AVERAGE START. Note that no data appears in the AVG trace. The instrument, if in a repeat trigger mode, will reject overloaded acquisitions for averaging. Lower the output level of the oscillator until the overload LEDs go out. Now the instrument accepts the data for averaging.

There are three separate types of dB Y-Axis Units available on this instrument: DB, DBV and DBR. The current selection, DB, is referenced to the input level in use (Full Scale Input Level is 0 dB). The Y-Axis Scaling full scale number will always track the selected Display Gain.

Press the Y UNITS FIELD LOCATOR button. Press SCROLL DOWN to select DBV. This selection is referenced to 1V (0 dB is one volt), therefore the DBV full scale value is 10 dBV. Position the cursor on the signal and notice the difference in signal level between the DB and DBV displays. There should be approximately a 6 dB difference since: 20 log (2) = 6, and DB is referenced to the 2V input level.

The next Y-Axis Units selection is DBR. The reference for this selection is determined by the VREF and the DB (@ VREF) control fields on Setup Page 5, Y CALIB PARAMETERS. The values set by Panel-Zero-Recall resulted in a reference of 0 dB at 1V, the same reference used in DBV. Press the SCROLL DOWN button to select DBR and compare the cursor Y-axis readout with those of the DB and DBV selections. Return to the DBR selection and display Setup Page 5 using the SETUP ON/OFF and PAGE ADV buttons. Position the RV on the Channel A VREF field using the SETUP DOWN button. Press 2, decimal point, 0 and ENT on the ENTRY group keypad. The DB (@ VREF) value is still 0.0, so the new reference is now 0 dB at 2V, the same as DB. Press RESET and again compare the cursor readouts of the DB, DBV and DBR selections. DB and DBR will have the same value while DBV is 6 dB lower in amplitude.

Make sure the RV is still on the Y UNITS control field and, using the SCROLL directional buttons, select EU (Engineering Units). The reference for EU is determined by the VREF, EU (@ VREF) and MV/EU fields on Setup Page 5. Frequently the operator will be obtaining signals from transducers which convert some needed quantity (the EU) to mV. These transducers are designed to output some certain mV per each unit of whatever they are measuring. By entering the mV/EU transducer sensitivity on Setup Page 5, and selecting EU Y-Axis Units, the operator effectively obtains a display calibrated in his "own " units. The value of the mV/EU field established by Panel-Zero-Recall is 100mV/EU (0.1V/EU), therefore all EU readouts should be ten times the Volts Y-Axis Units readouts. Switch the Y-Axis Units back and forth between V and EU to observe this.

While in the Volts display note the amplitude of the signal. Press the SETUP ON/OFF button to display Setup Page 5 and, using the ENTRY keypad, enter the previously noted signal voltage for CH. A VREF. Position the RV on the EU (@ VREF) field and enter 1.0. The instrument is now calibrated for one EU at the entered voltage. Return to the data display and select EU.

The cursor Y-axis readout will still be indicating ten times the Voltage readout. This is because the SD385 will not use the EU @ VREF for the transducer sensitivity unless the entered value for MV/EU is zero. Return to Setup Page 5 and enter a 0 for MV/EU. Return to the data display and note the readout is now 1.00 EU. Press SCROLL DOWN to select DB Y-Axis Units.

Another important units oriented capability of this instrument is the Y UNITS OPERATOR menu. This menu has the ability to modify the Y-AXIS UNITS and is available only when the Spectrum Group is selected.

In some applications, Y-units of EU^2 or V^2 may be more appropriate. Power Spectral Density measurements with units of V^2/Hz may also be desired. These units are available on Setup Page 4.

Press the Y UNITS button, and then press the MENU button. The MAG Y-UNITS menu will appear on the right side of the display as shown in Figure 1-16. Using the SCROLL group UP/DOWN buttons, select V.

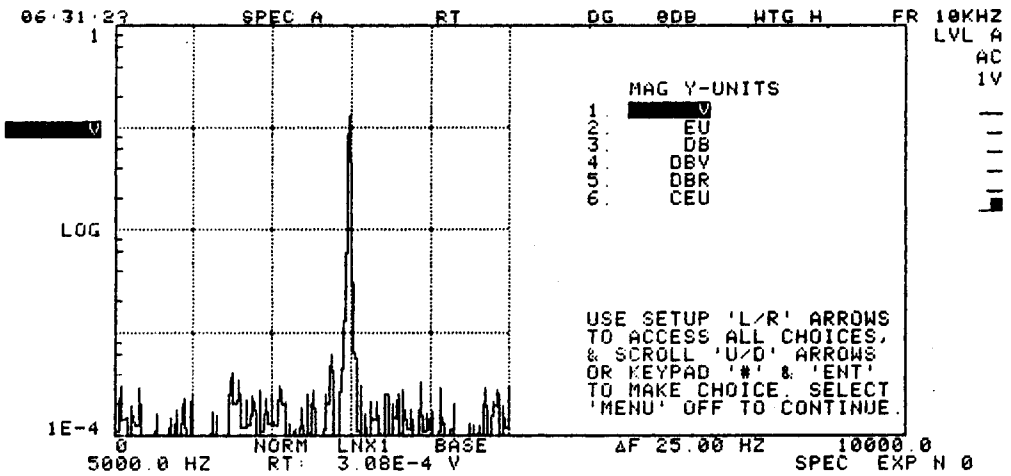


Figure 1-16. MAG Y-Units Menu Display

Press the SETUP ON/OFF button. If the Setup Page Listing appears, position the RV on selection 4, X & Y UNITS PAGE, and then press MENU. If a Setup Page appears, select Setup Page 4 using the PAGE ADV button (in either case you want to access Setup Page 4). Using the SETUP group UP/DOWN buttons, position the RV on the Y UNITS OPERATOR control field. Using the SCROLL group UP/DOWN buttons, select MAG^2. Press the SETUP ON/OFF button to return to the data display. The Y-UNITS menu should still be on the right side of the display. If not, press the MENU button. Note that the Y-UNITS menu title now says MAG^2 Y-UNITS and the Y-axis scaling and annotation on the left side of the display now reflects the MAG^2 Y-units values as shown in Figure 1-17.

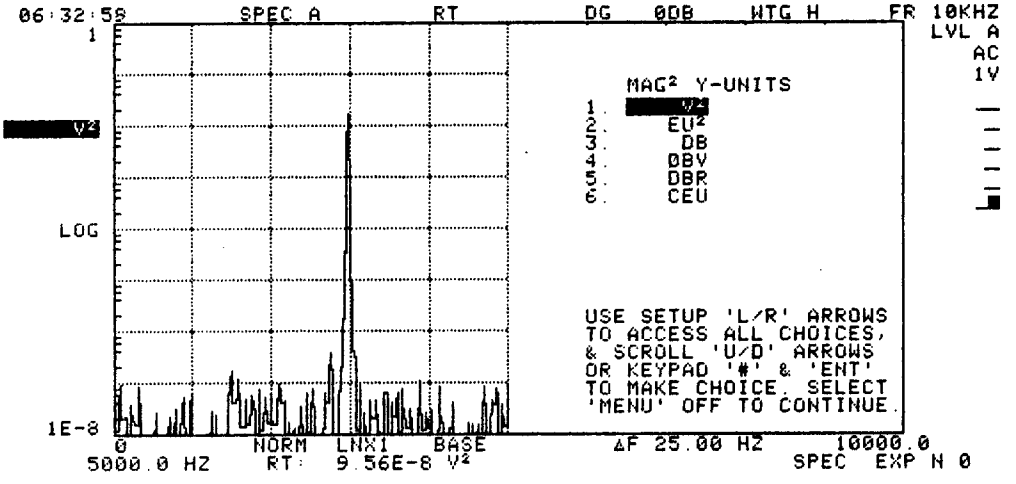


Figure 1-17. MAG^2 Y-Units Menu Display

Press the SETUP ON/OFF button to display Setup Page 4. Using the SCROLL group DOWN button, select MAG/$\sqrt{HZ}$. Press the SETUP ON/OFF button and note that the Y-UNITS menu is now titled MSD Y-UNITS (Magnitude Spectral Density Y-Units). Again note that the Y-axis scaling and annotation on the left side of the display now reflects the MSD Y-units values as shown in Figure 1-18.

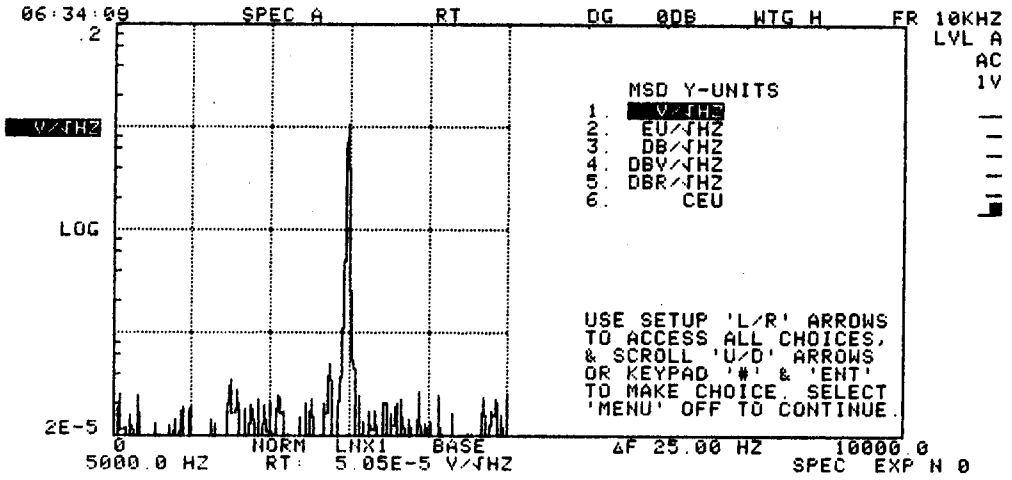


Figure 1-18. MSD Y-Units Menu Display

Press the SETUP ON/OFF button to display Setup Page 4. Using the SCROLL group DOWN button, select MAG^2/HZ. Press the SETUP ON/OFF button and note that the Y-UNITS menu is now titled PSD Y-UNITS (Power Spectral Density Y-Units). Again note that the Y-axis scaling and annotation on the left side of the display now reflects the PSD Y-units values as shown in Figure 1-19.

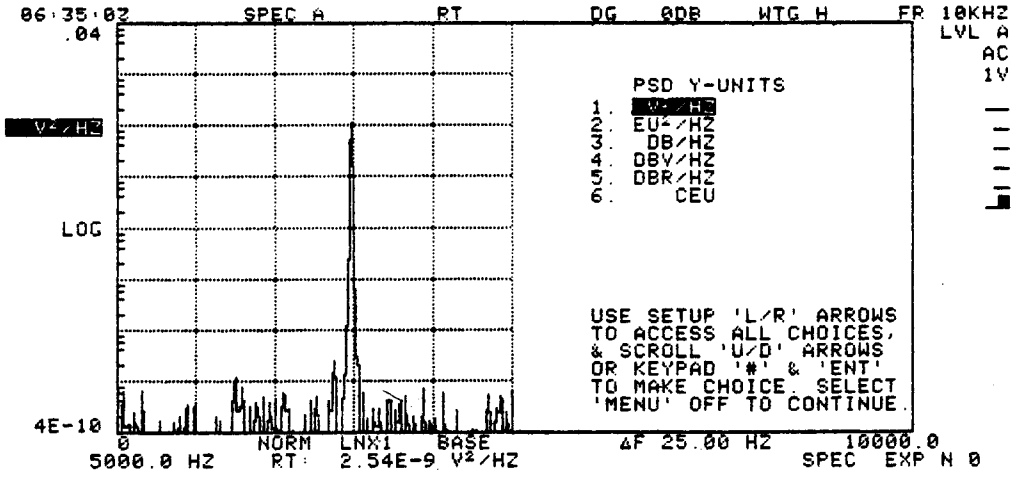


Figure 1-19. PSD Y-Units Menu Display

Using the SCROLL group DOWN button, position the RV on DB/HZ. Press the SETUP ON/OFF button to display Setup Page 4. Press the SCROLL group DOWN button. The RV should be on selection 1, MAG. Press the SETUP ON/OFF button to return to the data display and then press the MENU button to remove the Y-UNITS menu from the display.

Press the BAND FIELD LOCATOR button and the SETUP LEFT button to select the X-Axis Control field. This field allows the selection of various distributions of the X-axis to enhance data observation. Adjust the oscillator for a frequency of 5000 Hz. Position the cursor on the oscillator signal and SCROLL DOWN to select LNX2 (linear "times 2"). The X-axis has now been expanded with the cursor at the center of the display. Move the cursor and notice the trace moves and not the cursor. SCROLL DOWN again to select LNX4 and once more move the cursor while observing the display.

The next selection is LOG, which provides logarithmic distribution of the data along the X-axis. Adjust the oscillator for a frequency of 1000 Hz and SCROLL DOWN to select LOG. Place the cursor on the signal located on the graticule line to the right of center. The cursor X-axis readout should indicate 1000.0 Hz. Move the cursor to the graticule line left of center. The cursor readout should be 100.00 Hz as shown in Figure 1-20. The vertical grid lines used in the LOG display mark decade boundaries. For example, if the Full Scale Analysis Range is 500 Hz, the grid lines left and right of center will represent 5 Hz and 50 Hz respectively.

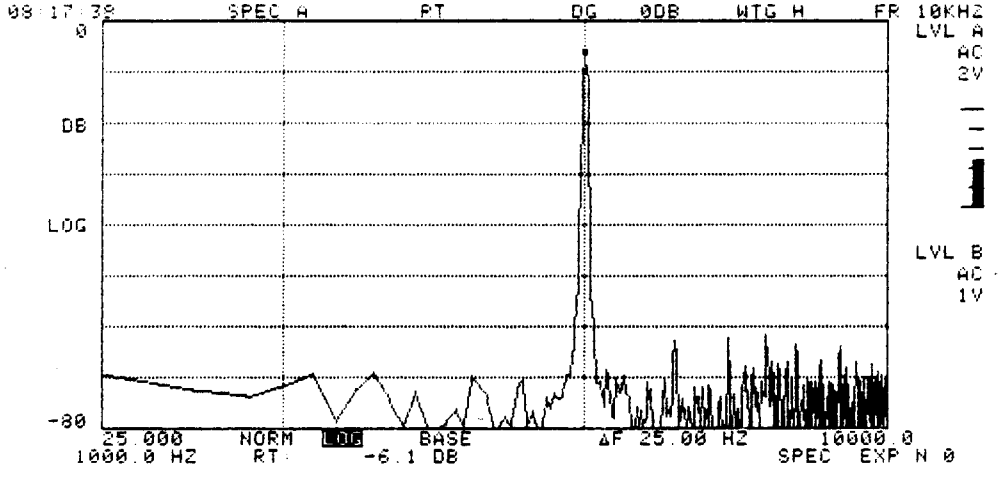


Figure 1-20. LOG X Display

Press the SCROLL DOWN button twice and the SETUP LEFT button once to reselect LNX1 and to position the RV on the CURSOR MODE field. The Cursor Mode provides added flexibility for obtaining cursor readouts. The analyzer is currently in the Normal (NORM) Cursor mode. Position the cursor on the signal. In this mode the cursor information line provides the X and Y values for the position of the cursor as shown in Figure 1-21.

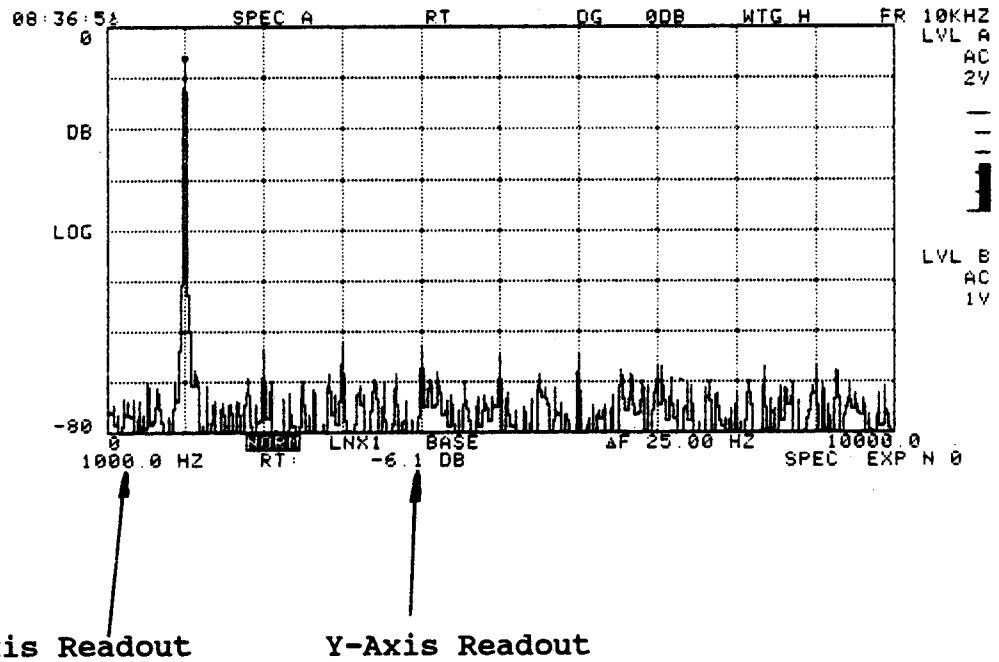
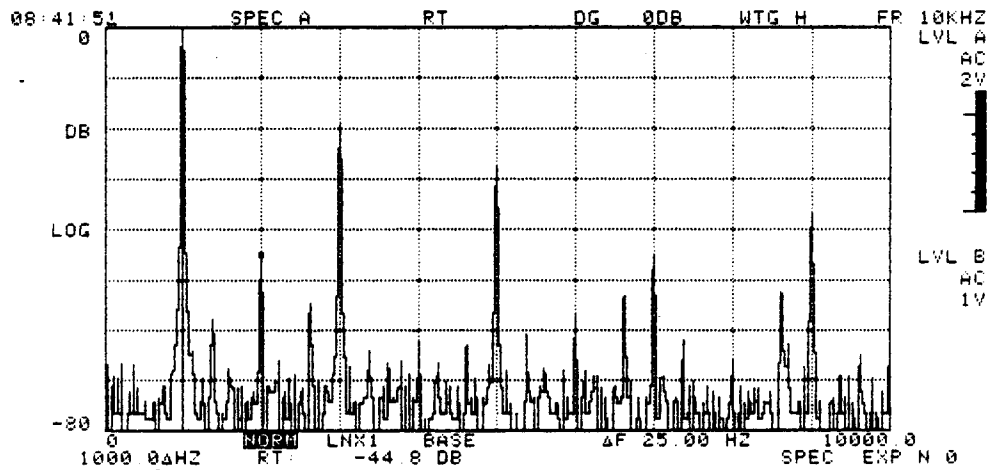


Figure 1-21. NORMAL Cursor Mode Readouts

Slowly increase the output of the oscillator until the Channel A overload LED lights and harmonics begin to appear on the display. The harmonics are caused by clipping in the A/D converter. This is major reason for insuring the proper input level is selected before performing any measurements. The cursor should be positioned on the 1000 Hz tonal, the fundamental frequency in this case. Located in the lower right corner of the CURSOR group is a button labeled SET. This button, in conjunction with the ENTRY keypad, is used to define various cursor-related reference locations for specialized measurements.

Press SET, 1 and ENT to enable the DELTA X Mode. A "line cursor" will appear at the cursor location and 0.0^Hz will appear at the left side of the cursor information line. Position the cursor on the second harmonic to the right of the fundamental, the ^Hz readout is displaying the difference between the SET 1 reference line and the present cursor position as shown in Figure 1-22. Press SET, 1 and CLR to return to the Normal Cursor Mode.



Delta Hz Readout

Figure 1-22. Delta X Display

Position the cursor on the fundamental tonal again and SCROLL DOWN to select the Harmonic Cursor Mode. A pattern of intensified dots, or cursors, will appear on each of the harmonics. The display should be similar to the example shown in Figure 1-23. These dots represent integer multiples of the fundamental cursor position. All of the dots may or may not line up with the harmonic tonals. In the Harmonic Mode, the data cursor manipulations cause fractional adjustments to be made to the fundamental, or reference, cursor location. This allows fine tuning of the cursor to aid in aligning the dots with the harmonic signals. Using the CURSOR group directional buttons, align the dots with the signals and note the increased resolution in the cursor frequency readout. The fractional adjustments to the fundamental cursor location are being used to obtain a high-resolution readout on the frequency of the fundamental.

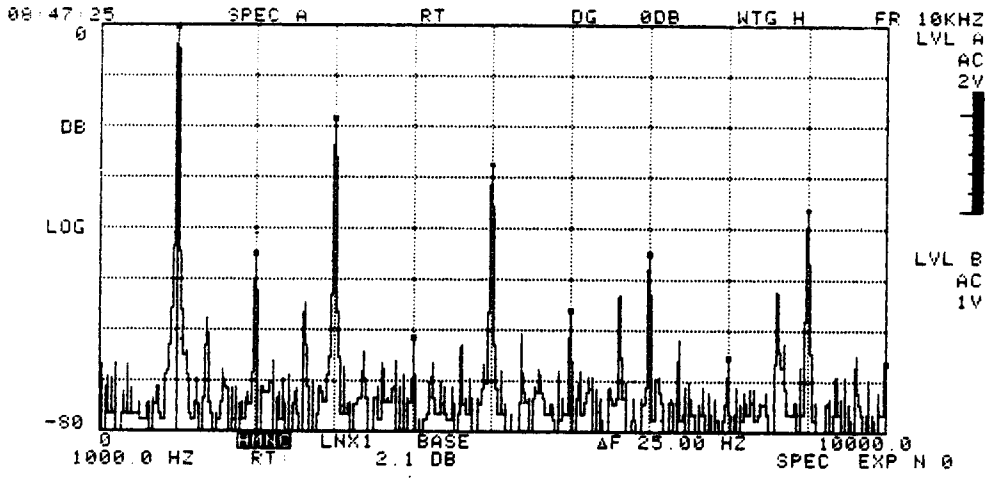


Figure 1-23. Harmonic Cursor Display

To move the cursor around the entire trace, without affecting the cursor alignment, press SET, 3 and ENT. Do so, and try moving the cursor around. Press SET, 3 and CLR and note that the cursor returns to the fundamental position.

Located in the bottom left corner of the CURSOR group is a button labeled LIST. Press it and note the listing that appears on the right side of the display is a Harmonic List. The harmonic list can be accessed only when the LIST button is pressed while the Harmonic Cursor Mode is selected. Figure 1-24 is an example of the Harmonic List.

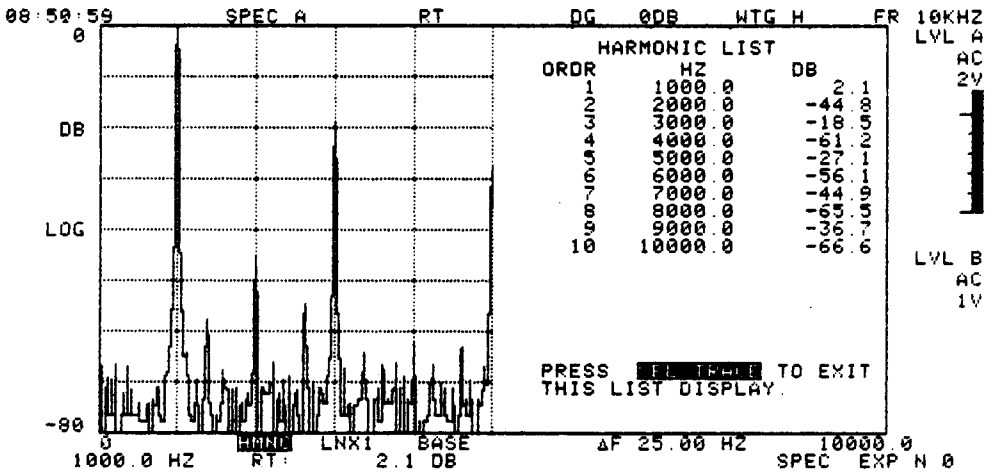


Figure 1-24. Harmonic List Display

Press SEL TRACE to remove the list from the display and SCROLL DOWN to select the ^P (Delta Power) Cursor Mode. The rms level bar that appears just to the right edge of the trace is now a graphic representation of the "Delta P Summation." Figure 1-25 is an example of the "Delta P Summation." An additional readout, ^P, is also contained in the cursor information line. Slowly adjust the oscillator for an output of 1V while observing the "Delta P Summation" Bar and ^P readout. Note that the amplitude of the bar decreases with the amplitude of the signal. The "Delta P Summation" Bar is the rms summation of the points from the left edge, or zero point, of the trace to the current cursor position. Position the cursor at the extreme left edge of the trace. Gradually move the cursor to the right while observing the bar. The readout increases as more data points are summed. A drastic increase will occur when the cursor reaches the oscillator signal.

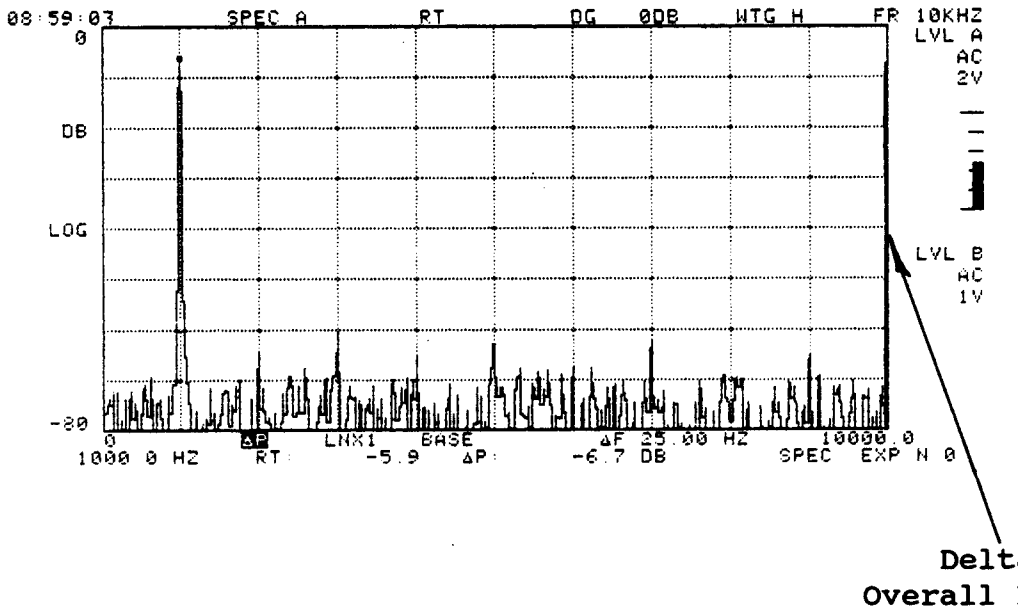


Figure 1-25. The Delta P Display

In some applications it may be desirable to limit the points to be summed in the Delta P Mode. The SET 1 feature may be used to define a new start or reference point. Gradually increase the output of the oscillator until harmonics begin to appear on the trace. Move the cursor to the 2750 Hz position on the trace and press SET, 1 and ENT. Note that the trace to the left of the reference is zeroed and the Overall Bar has disappeared. Move the cursor to the right and the bar will increase. Only those points to the right of the reference line are summed.

At times, with dynamically shifting data, the power within a set of frequencies is of great interest. An exact and permanent Delta P window can be defined by setting a second reference with the SET 2 feature. Only the area within the two references will be summed. The cursor can be used to take readings on specific points of interest inside the window.

Position the cursor at 7250 Hz (a ^Hz readout of 4500Hz) and press SET, 2 and ENT. Only the data between the reference lines will be summed and displayed. Change the oscillator frequency to 5000 Hz and the output to 1V, the signal should appear in the window. The cursor may be moved to the signal and a readout of that tonal, in addition to the power from 2750 Hz to 7250 Hz, may be obtained.

Press SET-1-CLR and SET-2-CLR to clear the reference lines. Return to the Normal Cursor Mode and select the lower display trace by pressing the SEL TRACE button. Make sure the lower LED just to the left of the button is lit. The Average Memory is now being displayed. Press AVERAGE START and vary the oscillator frequency to produce four or five tonals on the trace as shown in Figure 1-26. Press AVERAGE STOP.

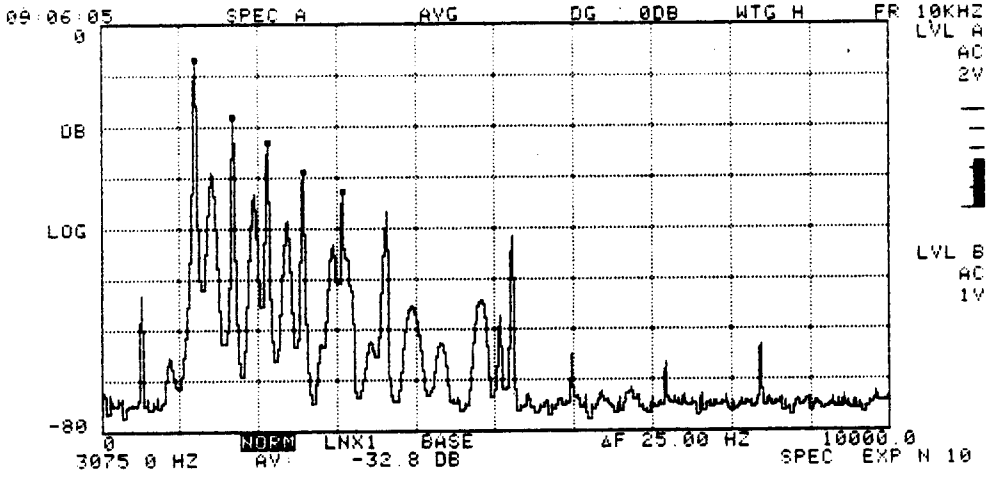


Figure 1-26. Average Memory Data

Located in the CURSOR group is the MARK button. This control allows the operator to mark, or identify, up to ten points of interest, identified as marks 0 through 9. Position the cursor on the left-most tonal and press MARK, 0 and ENT. Move to the next tonal and press MARK, 1 and ENT. Notice that a cursor dot remains at the MARK 0 location. Continue until five positions have been marked.

Press the MARK and LIST buttons to display the Mark List as shown in Figure 1-27. This display is a table of X and Y readouts of the marked points. Press LIST to exit this display and, using the SEL TRACE button, return to the upper trace to display Real Time data.

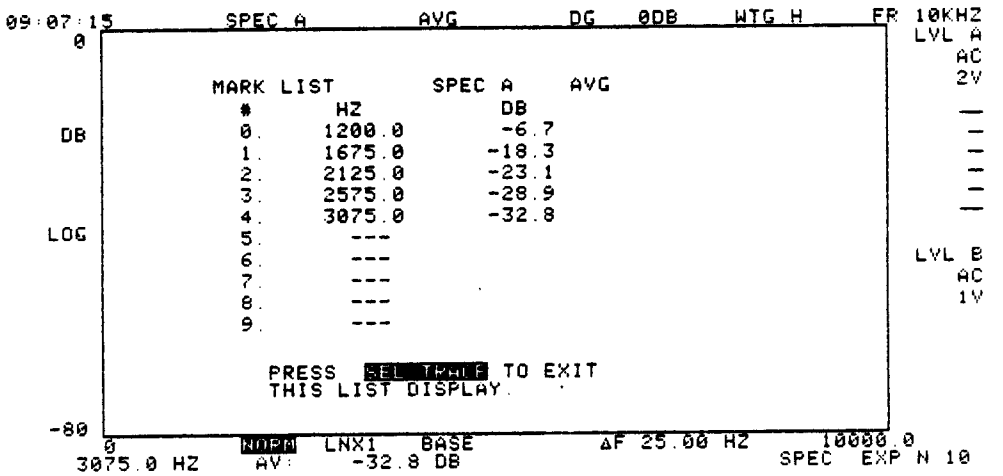


Figure 1-27. Average Memory Mark List Display

Note the additional cursor dots on the display. When the Mark feature is being used, it is difficult to determine which of these dots is the Data Cursor and which ones are the marks. (This also occurs when in the Harmonic Cursor Mode and SET 3 is entered.) An additional feature of the SET button allows the operator to identify the current cursor position with a solid vertical line. Press SET and ENT (no number) and a permanent line cursor will appear on the display as shown in Figure 1-28. Press SET and CLR and the line cursor will disappear and the instrument will once again show the current cursor position as a dot.

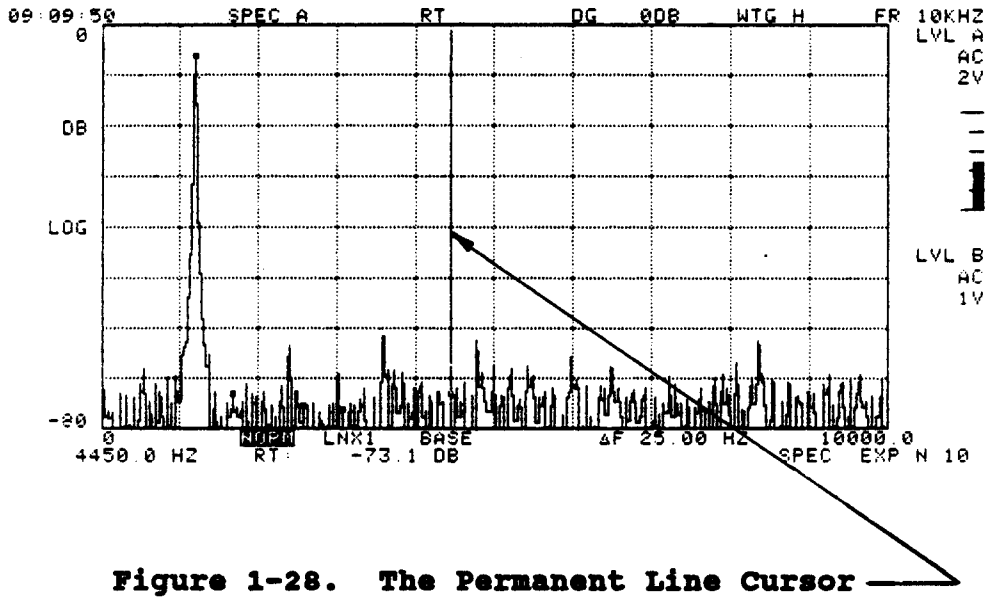


Figure 1-28. The Permanent Line Cursor

Position the cursor on the signal and press MARK, 6 and ENT. A message will appear on the right side of the display as shown in Figure 1-29.

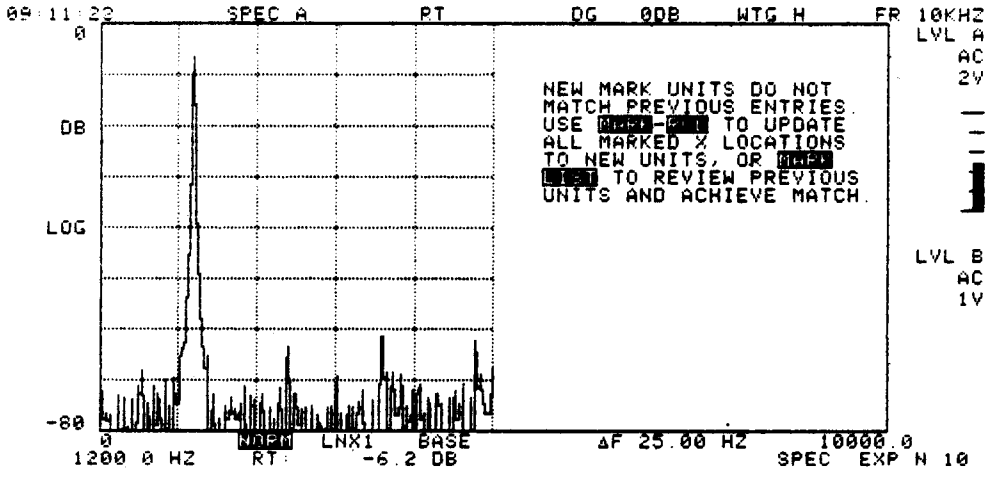


Figure 1-29. Mark List Error Message

The displayed memory has been changed from Average to Real Time and the Mark feature will not update from two different sources. Pressing MARK and RCL will cause all of the marks to be updated with new calibration data. Press MARK, RCL, MARK and LIST. The Mark List titles have been changed from AVG to RT and the readings are low amplitude as shown in Figure 1-30.

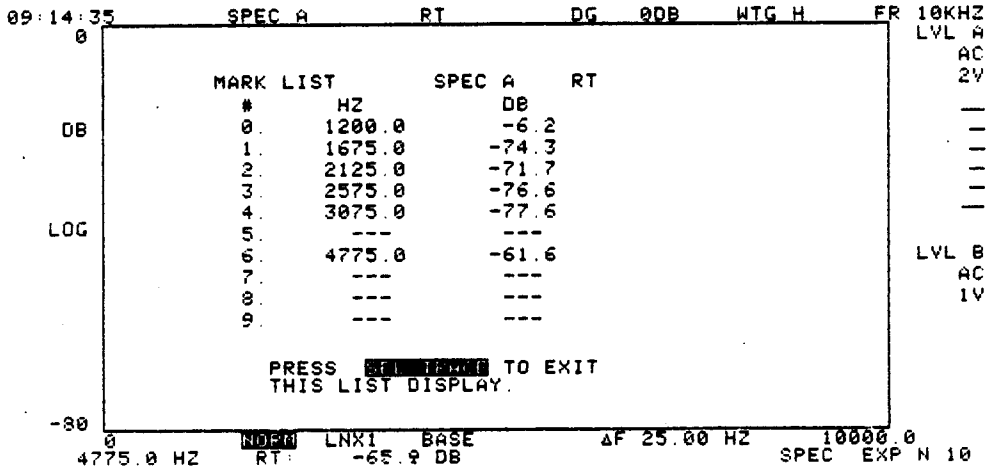


Figure 1-30. Real Time Memory Mark List Display

Press MARK, 0 and CLR, note that the left-most mark disappears. In this manner individual marks may be cleared. To clear all marks simultaneously, press MARK and CLR (no number). Do this and the remaining marks will disappear from the display.

Another useful feature is the Tracking Cursor Mode. There are three types of tracking available: TRK1 (Tracking Cursor Mode 1), TRK2 (Tracking Cursor Mode 2) and TRK3 (Tracking Cursor Mode 3).

TRK1 will track any frequency shift of a constant amplitude signal. The signal amplitude should be unique; i.e., no other displayed signal should have the same amplitude as the one desired to be tracked.

TRK2 will track any amplitude variation of a signal as long as the frequency shift does not exceed 10%. The Data Cursor should be placed on the tonal of interest before selecting either of these modes.

TRK3 locates the highest amplitude signal in the trace and tracks it anywhere in the selected frequency band. This feature is useful in the auto-tracking of doppler shift frequencies.

Adjust the oscillator for 1000 Hz, and increase the output to obtain harmonics. Place the cursor on the fourth harmonic. Position the RV on the Cursor Mode field and select TRK1 by Scrolling down three times. Note how the cursor has a tendency to jump from harmonic to harmonic. This is because the harmonics have approximately the same amplitude.

Position the cursor on the fundamental tonal and slowly decrease the output of the oscillator to 1V. Vary the oscillator frequency within the range of the display and note how the cursor tracks the tonal.

TRK1 works well with signals that rapidly vary in frequency and are constant in amplitude. However, if the signal's frequency variations cause it to exceed the displayed frequency range, the tracking system will seek a new amplitude to track and will not reacquire the original signal when it is again in the range of the display.

Momentarily increase the frequency of the oscillator to a value above the display range. The cursor will probably lose track and will be randomly tracking the baseline noise. Place the cursor on the tonal and it will begin tracking again.

Press the FUNC FIELD LOCATOR, SETUP UP, and SCROLL DOWN buttons to enter the Time display. Adjust the oscillator for a frequency of approximately 200 Hz. Observe the movement of the cursor as the TRK1 algorithm attempts to find a unique amplitude peak to track.

Display Setup Page 1, ACQUISITION PAGE and select menu item 4, REPEAT (AMP) TRIG on the UPDATE MODE menu. Press SETUP ON/OFF to return to the data display. Position the cursor on a different peak than the one on which it is now residing. Vary the oscillator frequency while observing the cursor.

This inability of the tracking system to differentiate between similar amplitude signals is the reason TRK1 will not work in the Time Domain. Most time domain signals are periodic, thereby causing repetitious amplitudes.

SCROLL DOWN to select TRK2, and position the cursor at the second peak. Vary the oscillator frequency slightly and the cursor will now remain in position. SCROLL DOWN to select the Normal Cursor Mode.

1-3.5 Using the Text Entry Feature

This feature enables the operator to enter text onto the display via the front panel buttons or the IEEE interface bus. The front panel TEXT button is used to turn the feature on and off.

Press the TEXT button and note the appearance of the Text Entry Cursor in the upper left corner of the display as shown in Figure 1-31.

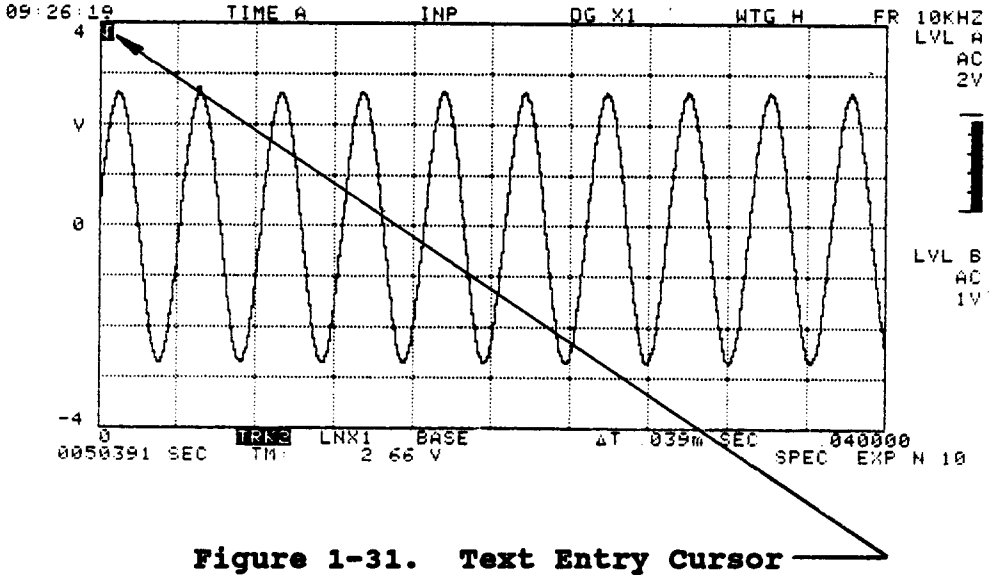


Figure 1-31. Text Entry Cursor

Press the RESET button and an "A" will appear where the cursor was and the cursor will have moved one space to the right. Located in the upper right corner of the RESET button is a small letter "A." Other buttons also have small letters and characters in their upper right corners. These buttons, in conjunction with the numerical entry keypad, enable the operator to enter text on the display when the Text Mode is selected. The SETUP group directional buttons control the movement of the cursor (with wrap-around in all directions).

Press the SETUP DOWN button and the cursor will move down. Press the RESET button 8 times to place a string of "A's" on line 2. SETUP LEFT four times and press the CLR and SETUP DOWN buttons. Four of the "A's" have been cleared from the display. Press RCL and they will reappear at the present cursor position. Press the SETUP DOWN and RCL button and four more "A"s will appear. In this manner blocks of text may be duplicated and moved to various parts of the display.

Press the CLR button twice to clear the transfer buffer. Press SETUP DOWN and RCL and note that no "A's" appear. Press SETUP UP and CLR twice to clear line 3. Pressing the CLR button erases all text characters to the right of the Text Entry Cursor.

Pressing CLR immediately upon entering the Text Mode will erase all text entries. Press the TEXT button to exit the Text Mode and once more to reenter it. Press CLR and note that all entered text is erased. Press RCL and note that the display still has no text. Press the TEXT button to exit the Text Mode.

1-3.6 Scrolling Through the Input Memory

Perform a Panel-Zero-Recall and adjust the oscillator for an output of 3000 Hz at 0.75V. Select an input level of 2V for channel A.

Press the HOLD, FREQ Field Locator and SCROLL DOWN buttons to select the 5kHz analysis range.

Press UPDATE and vary the oscillator frequency. Press HOLD. Select the TIME and SPECTRUM display by positioning the RV on the FUNCTION GROUP field and pressing SCROLL DOWN. The Time Domain trace displayed is one block, or memory period, of data from the Input Memory.

The Input Memory may be accessed, one block at a time, using the INPUT MEMORY group LEFT/RIGHT buttons. Press the INPUT MEMORY RIGHT button and notice the change in the data.

Continue pressing the INPUT MEMORY RIGHT button watching the changes in both traces. The display is being advanced one full memory period into the Input Memory each time the INPUT MEMORY RIGHT button is pressed.

Press AVERAGE START and observe the Spectrum trace. The instrument will automatically advance through the Input Memory when averaging is performed. Notice the amount of shift in the signal each time a new memory period is displayed. Press the AVERAGE STOP and MEM buttons.

Display Setup Page 1 and select menu item 1, 3/4, on the OVERLAP SELECT menu. Press the SETUP group SETUP ON/OFF button to return to the data display, and then press the FIELD LOCATOR group MEM and INPUT MEMORY group RIGHT buttons. The display has been advanced only one-fourth of a memory period into the Input Memory. This results in a 3/4 or 75% overlap of data. Continue pressing the INPUT MEMORY group RIGHT button while observing the data.

Press AVERAGE START and again note the amount the signal shifts. It should be approximately one-fourth as much as before. Press the AVERAGE group STOP and FIELD LOCATOR group MEM buttons and select 0% overlap from Setup Page 1. Return to the data display.

Adjust the output of the oscillator for 3kHz, 0V. Press UPDATE and, after waiting 3 or 4 seconds, rapidly adjust the oscillator output up to 1V and back to 0V to create a "burst" of signal. Press the HOLD button. Press the BAND Field Locator and SETUP LEFT buttons to position the RV on the X-AXIS SCALING field. Press the SCROLL UP button to select the CMPRSD (compressed) display.

The wide, vertical, reverse video bar on the upper trace is the Block Cursor as shown in Figure 1-32. It represents the current block pointer position in the Input Memory. The location of the signal "burst" should now be obvious. Position the Block Cursor on the burst using the INPUT MEMORY group LEFT and RIGHT buttons. Observe the Spectrum trace while moving the Block Cursor.

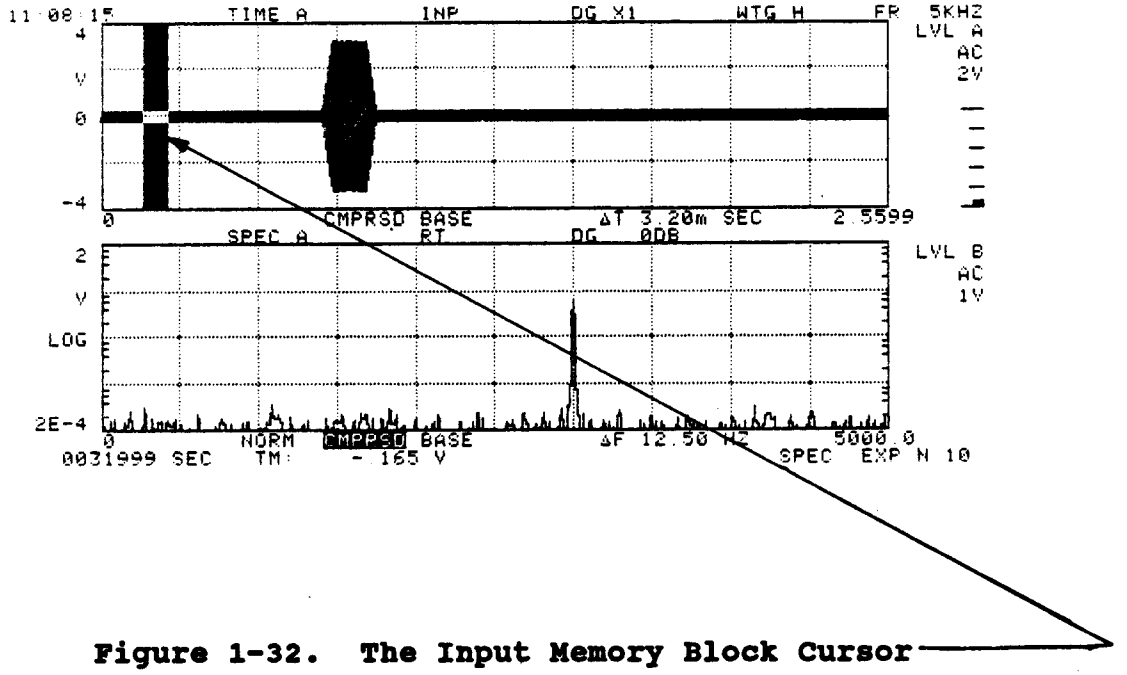


Figure 1-32. The Input Memory Block Cursor

Once the cursor is position on the signal, press SCROLL DOWN to select LNX1 for the X-Axis to observe the non-compressed time data for the selected memory period.

The CTIME & TIME selection (menu item 3) on the TIME FUNCTION menu allows simultaneous viewing of both compressed and non-compressed time data. Press the FUNC Field Locator, 3 and ENT buttons to select the CTIME & TIM function. Figure 1-33 is an example of a CTIME & TIME display.

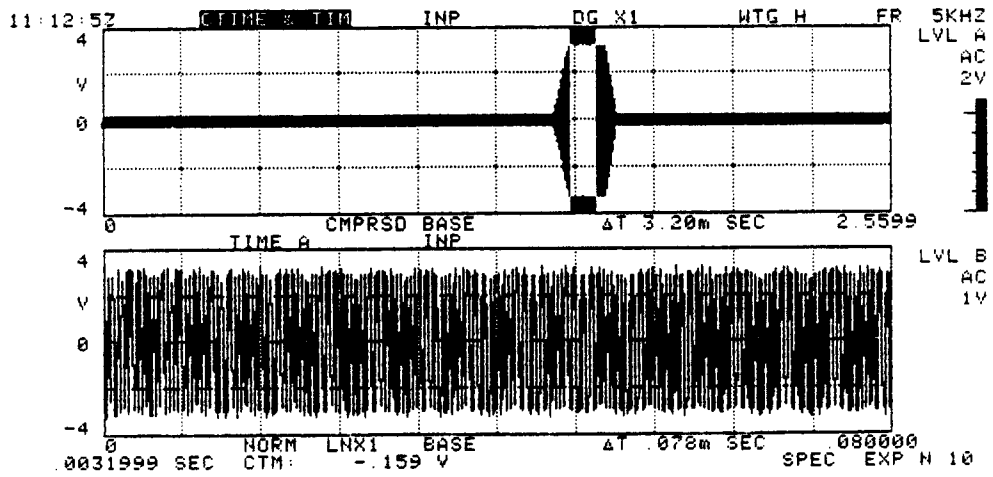


Figure 1-33. CTIME & TIME Display

The lower trace is the non-compressed time data outlined by the Block Cursor in the upper (compressed) trace. Using the Input Memory LEFT/RIGHT buttons, move the cursor around in the signal burst to get an idea of the relationship between the two traces.

Press AVERAGE START and notice the movement of the cursor. A large portion of the data being averaged is "zero", or no data. Boundaries can be established that limits the averaging process to a particular area of the Input Memory. Press the STOP button and position the Data Cursor slightly to the left of the burst. Press SET, 1 and ENT to establish the left boundary. Position the cursor slightly to the right of the signal burst and press SET, 2 and ENT to establish the right boundary.

Press AVERAGE START and observe the new boundaries during the average. Press the AVERAGE STOP button. Press SET, 1, CLR, SET, 2 and CLR to remove the reference boundaries.

1-3.7 Using the Waterfall

The Waterfall feature is a built-in peripheral that stores time sequential records of analyzer display data and displays this data in a 3-dimensional, cascaded format.

Waterfall loading/updating will not occur when any of the following selections are made:

1. Any multi-trace display function
2. 800 Lines of Resolution
3. Any X-Axis data distribution other than LNX1 (i.e., no LNX2, LNX4, LOGX)
4. The displayed trace is Time Domain data

Perform a Panel-Zero-Recall and select the upper trace using the SCROLL group SEL TRACE button. Press the WATERFALL group LOAD button and vary the oscillator frequency for approximately 10 seconds, then press WATERFALL HOLD.

In this instrument, both the analyzer and Waterfall are always enabled with one in the "foreground" and one in the "background". The preceding steps executed a Waterfall load with the analyzer in the foreground (displayed). The Waterfall data can be shifted to the foreground, or displayed, by pressing the WATERFALL group DISP ON/OFF button. Press the DISP ON/OFF button, and the Waterfall display will appear as shown in Figure 1-34.

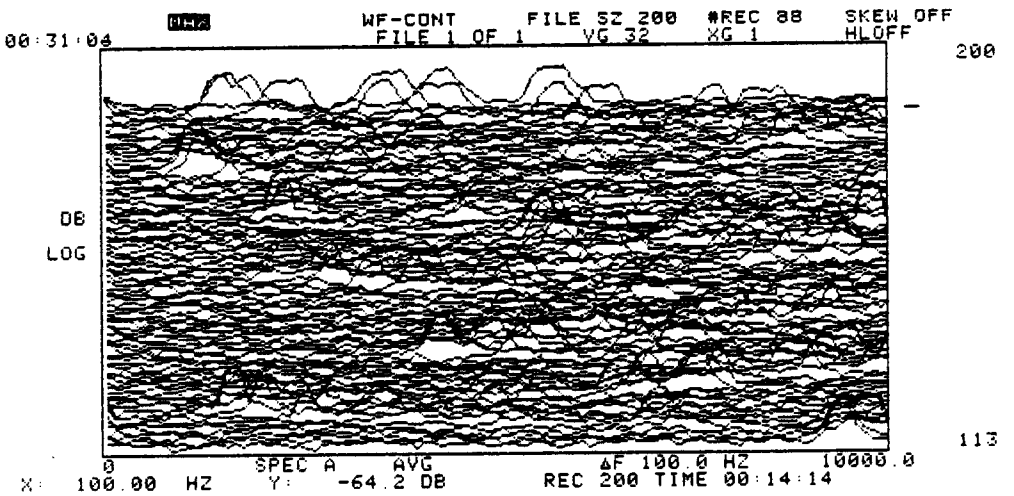


Figure 1-34. The Waterfall Display

Press LOAD and vary the oscillator frequency again while watching the display. Press HOLD.

Press DISP ON/OFF to return to the analyzer display. Press the BAND Field Locator and the SETUP RIGHT buttons once, and the SETUP DOWN button twice to select 100 lines of resolution. Return to the Waterfall display by pressing the DISP ON/OFF button.

Press Waterfall LOAD and note the message displayed at the top of the display. The instrument will refuse to load data that is not exactly compatible with previously stored data. This is to insure that calibration is maintained. Updating will not occur if any of the following settings are changed during the updating process:

1. X-Axis Units or Gain
2. Y-Axis Units or Gain
3. Display Function
4. Display Trace
5. Display Memory
6. Full Scale Analysis Range
7. Displayed Channel; e.g., switching from channel A to B
8. Number of Lines of Resolution

Press CLEAR and observe the message that appears at the top of the display. Press CLEAR again while the message is displayed and the current file will be erased. This is to prevent accidental erasure of any data.

Press LOAD and note the increased rate at which the Waterfall is updating. This is due to the selection of 100 lines vice 400 lines.

Loading of the Waterfall is also controlled by the UPDATE MODE field. The RV should be positioned on the annotation "MAX" located in the upper left corner of the display. This is the UPDATE MODE field. Press HOLD and SETUP DOWN to select the % LEVEL Update Mode. Display Setup Page 6, WATERFALL CONTROL PAGE, and press SETUP UP, 8, 0 and ENT to enter 80 in the % LEVEL field.

Press SETUP ON/OFF to return to the data display and adjust the output of the oscillator for 0V. Press LOAD and slowly increase the output of the oscillator until records begin to be loaded into the Waterfall. In the % LEVEL Mode, Waterfall data acquisition does not occur until the amplitude of the data equals or exceeds the entered percentage of full scale Y-Axis. Press HOLD.

Press SETUP DOWN to select the AVG RCYCL (Average Recycle) Mode. Press DISP ON/OFF, MEM Field Locator, SETUP UP and SCROLL DOWN to return to the analyzer display and select the lower trace for display. Press the AVG Field Locator, SETUP RIGHT and SCROLL UP to select SUM Averaging. Return to the Waterfall display and press CLEAR twice.

Press LOAD and vary the oscillator frequency. Note the slow rate at which the Waterfall updates. This is due to the fact that the analyzer acquires and averages 10 data ensembles before a Waterfall update occurs. Press AVG # (located on the ENTRY keypad), 3 and ENT to change the AVG N to 3. The update rate should increase, as only 3 ensembles are involved in an average.

Press SETUP UP twice to select MAX.

To provide more operator flexibility, the Waterfall incorporates three display enhancement features: SKEW, HIDDEN LINES and % SUPPRESSION. These three features enable the operator to enhance the displayed data without affecting the data stored in memory.

The SKEW features provides a right skew of the Waterfall display. This allows the operator to see around peaks that occur in a straight line. This feature will operate in the HOLD mode only. Press SETUP LEFT to position the RV on the SKEW OFF annotation and SCROLL DOWN to obtain a skewed display as shown in Figure 1-35. Press SCROLL DOWN again to return to the normal display.

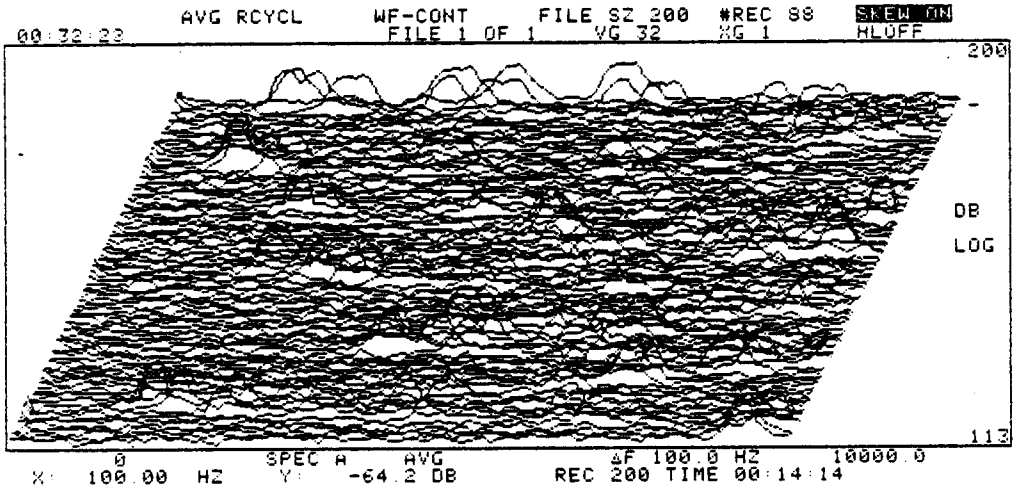


Figure 1-35. SKEW Display

Sometimes there is difficulty in discerning the data pattern because of the blending of all the information on the display. The Hidden Lines feature blocks data that occur "behind" data peaks. Press SETUP DOWN and SCROLL DOWN to activate the Hidden Lines display. It is now much easier to extract information from the data as shown in Figure 1-36.

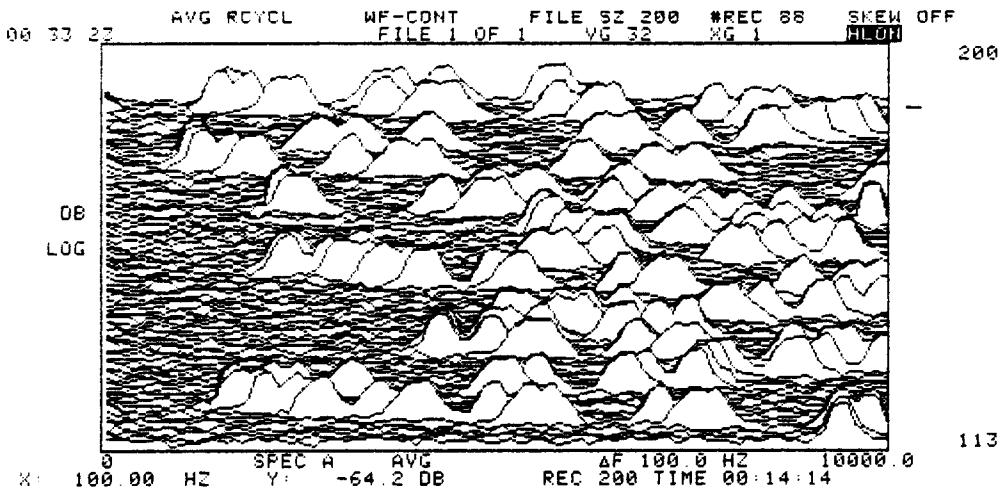


Figure 1-36. Hidden Lines ON Display

Occasionally, important information is difficult to see because of a noisy baseline. The % SUPPRESSION feature suppresses data below a specified % of full scale as shown in Figure 1-37. Press SETUP ON/OFF to display Setup Page 6 and SETUP DOWN twice to position the RV on the % SUPPRESSION field. Press 2, 0 and ENT to enter 20% Suppression. Return to the Waterfall display and note the difference. Position the RV on the UPDATE MODE field by pressing the SETUP UP and RIGHT buttons. SCROLL UP twice to select MAX.

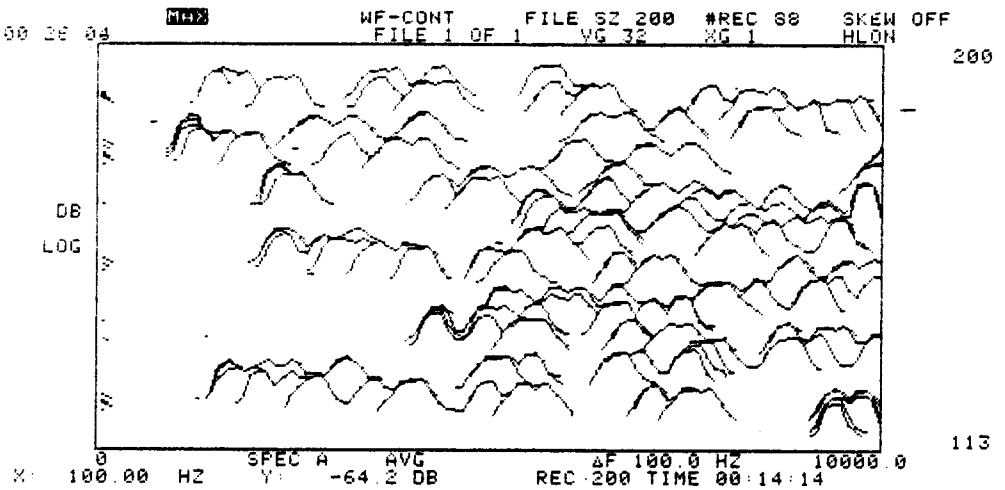


Figure 1-37. 20% Suppression Display

Return to Setup Page 6 and enter 0 for % of Suppression. Press SETUP ON/OFF to return to the Waterfall display and SETUP LEFT twice to position the RV on the VERTICAL GAIN field (VG 32). Scroll through the various settings observing the effect on the display. Return to a gain setting of 32.

Press SETUP UP and RIGHT to access the RECORDS PER DISPLAY field and scroll through the menu. Although fewer records are displayed, it is easier to see each individual record without interference from adjacent ones. Press 4 and ENT to select the 10 record display.

Return to the analyzer display and, using the SEL TRACE button, select the upper trace for viewing. Press DISP ON/OFF to return to the Waterfall display.

Press the SETUP LEFT button twice to access the Waterfall DISPLAY MODE field. SCROLL DOWN to view the various signal trace displays that can be obtained from the Waterfall portion of the instrument: Single records, the peak value detected at each X location and a profile of an X location with respect to TIME, RPM or RECORDS.

Return to the WF-CONT (Waterfall Continuous) mode and press the SCROLL group WATERFALL button. This activates the Waterfall Scroll feature. Note the message that appears, momentarily, at the top of the display. The Hidden Line feature has been forced off.

Press SCROLL UP to scan through the records one at a time. Press the CURSOR DOWN button to position the Data Cursor on different records. Notice that movement of the Data Cursor is restricted to only those records fully displayed. Press the CURSOR RIGHT button to move the Data Cursor along the X-axis of the record. Press the SCROLL group WATERFALL button to disable Waterfall Scroll.

Press SCROLL DOWN twice to select the SINGLE Display Mode. Press CURSOR UP and DOWN buttons to step through the Waterfall Memory one record at a time. Only the records displayed, in this case 10, may be viewed.

1-4.1 Input

Voltage Ranges	100mV, 200mV, 500mV, 1V, 2V, 5V, 10V rms
Input Impedance	500kohms
DC Isolation	Input signal low may be floated up to 20Vrms from chassis ground.
ICP Power	24Vdc, 4mA ICP power.
Coupling	DC or AC (-3 dB @ 0.7 Hz)
Input controls	1) Overload condition for both channels indicated on front-panel LED's. 2) Autorange (unit automatically samples overload condition and sets input level to that which is just above the highest level to overload). 3) Bar indication of rms level of input signal on screen when operator is displaying Real Time or Input data.
Resolution	12-bit A/D converter, capable of a sampling rate of 51.2kHz.
Test signal	80mV +/- 10% @ 80 Hz, 800 Hz or 8kHz (+/- 2 Hz)
Sample Clock	Internal or external TTL compatible connection.
Input Memory	1) 32,768 samples (per channel). 2) Display in Time Domain 256, 512, 1024 or 2048 samples when in update or hold. When in hold only, display all 32,768. 3) When in hold only, operator can specify any 256, 512, 1024 or 2048 block out of the 32,768 for display/process via input memory scroll. Analyzer will automatically scroll-access input memory when averaging if memory is in hold.

Input Memory Control

Scrolling can be overlapped by designated overlap factor.

Front-Panel UPDATE button will initiate load of input memory which will continue until:

a) UPDATE is pressed again.

b) Front-panel HOLD button is pressed and memory is full.

c) Memory goes into hold because of triggered acquisition, if indicated.

Front-panel "MEM FULL" LED indicates when 32,768 contiguous points have been loaded.

Overlap factor controls average acquisition unless max overlap is indicated (allows user to indicate percentage of new data required for average). Overlap factors are:

None, 1/4, 1/2, 3/4, 7/8, MAX

Designated FREE RUN, Single (one shot) triggering, or repeat triggering. Trigger source can be + or - signal amplitude threshold or tach input when SRA/TACH Option is installed. Front-panel "TRIG" LED indicates when trigger has occurred. When triggered acquisition is enabled, only non-overloaded, triggered blocks of data will be averaged.

Triggered block can be acquired before or after trigger via delay control.

If two-channel acquisition, Channel B can be acquired with a positive or negative delay relative to Channel A.

Delays are limited only by the length of the input memory.

1-4.2 Frequency Characteristics

LPF	1) Analog LPF for anti-aliasing and out-of-band power filtering with cutoff frequencies of 663 Hz, 2.81kHz, 10kHz and 20kHz. 2) Digital LPF with nominal 120dB/octave rolloff for anti-aliasing all frequency ranges between analog filter corners.
Frequency Ranges (Hz)	100, 200, 500, 1k, 2k, 5k, 10k, 20k
Frequency Resolution	Full-Scale Hz - 100, 200, 400 or 800 lines (if zoom selected, resolution will be increased by selected zoom factor).
Zoom	Available Zoom factors are frequency range dependent.

Freq Range	Sample Rate	LPF Cutoff	Zoom Factors
20kHz	51.2kHz	20kHz	(see following paragraph)
10kHz	25.6kHz	10kHz	2,4,8,16,32,64,128
5kHz	25.6kHz	10kHz	2,4,8,16,32,64
2kHz	10.24kHz	2.81kHz	2,4,8,16,32,64
1kHz	10.24kHz	2.81kHz	2,4,8,16,32
500 Hz	2.56kHz	663 Hz	2,4,8,16,32,64
200 Hz	2.048kHz	663 Hz	2,4,8,16,32
100 Hz	2.048kHz	663 Hz	2,4,8,16

When the 20kHz range is selected, narrow band data can be analyzed in the Zoom band only if the Input Memory is in HOLD. Limit is a Zoom of 16, or that imposed by the scroll limits established by entry of SET-1, SET-2. This will allow Zoom analysis of "held" 20kHz data.

Center frequency can be set by cursor location (when cursor has Hz readout) or by user entered frequency. Center frequency entered must be within narrow band window and will be clamped to keep highest frequency of resultant data from exceeding FS frequency of narrowband and to keep lowest frequency above 0 Hz.

Zoom frequency accuracy is +/- .0025% of the center frequency.

Octave Band Analysis	5 1/1 Octave bands or 15 1/3 Octave bands. 10 1/1 Octave bands or 30 1/3 Octave bands.

Available Ranges

5 Octaves	15 1/3 Octaves
500 Hz to 8kHz	400 Hz to 10kHz
250 Hz to 4kHz	200 Hz to 5kHz
125 Hz to 2kHz	100 Hz to 2.5kHz
63 Hz to 1kHz	50 Hz to 1.25kHz
31.5 Hz to 500 Hz	25 Hz to 630 Hz
16 Hz to 250 Hz	12.5 Hz to 315 Hz
8 Hz to 125 Hz	6.3 Hz to 160 Hz
4 Hz to 63 Hz	3.15 Hz to 80 Hz

10 Octaves	30 1/3 Octaves
16 Hz to 8kHz	12.5 Hz to 10kHz
8 Hz to 4kHz	6.3 Hz to 5kHz
4 Hz to 2kHz	3.15 Hz to 2.5kHz
2 Hz to 1kHz	1.6 Hz to 1.25kHz

Acoustical Weighting	A, C, FLAT, A overall only. C overall only in accordance with IEC 179.
Passband Uniformity	Meets ANSI S1.11-1966 CLASS III for 1/3 Octave filters CLASS II for 1/1 Octave filters (to -60dB from full-scale amplitude)
Linearity	+/- 1dB or +/- 1% of amplitude full scale, whichever is greater.

1-4.3 Analysis Performance

Dynamic Range	76dB below the selected full-scale input.
Noise Floor	Below 72dB (averaged) from the selected full-scale input.
Spurious Components	Below 70dB from the selected full-scale input.
Amplitude Linearity	+/- 0.5dB or +/- 0.025% of full-scale for bin centered data to 70dB below full-scale.
Frequency Response	+/- 0.5dB at bin centers over entire frequency range.
Available FFT Weighting Windows	Hanning Flat Top Rectangular ("boxcar") $1/e$ $1/e^2$ $1/e^3$ $1/e^4$ Force-response (start for data zeroing controlled by set-4). Each of the exponential weightings will yield force response weighting in Channel A only if Set-4 is entered. Exponential weighting if Set-4 is cleared.

1-4.4 Calibration Parameters

Signal Level Units Time & Frequency Domain, Y-Axis	V - Volts (rms in Frequency Domain, instantaneous in Time Domain).
	EU - Engineering Units (Computed from user entered sensitivity, 0.0001 to 9999mV/EU. RMS in Frequency Domain, instantaneous in Time Domain).
	CEU - Compensated Engineering Units computed from user entered sensitivity, 0.0001 to 9999mV/EU. In frequency domain, will display CEU designated by user. In time domain, will be transducer CEU designated by user (rms, pk, pk-pk determined by type of CEU). English or metric units can be designated for acceleration, velocity and displacement probes and display CEU.
Signal Level Units Frequency Domain only, Y-Axis	dBR - dB Reference. Computed from user entered dB (0 to 200dB) @ Voltage ref (0.0001 to 9999 V).
	dBV - dB Volts (computed from 0dB @ 1.0V).
	dB - (computed from 0db at input level full-scale).
Frequency Domain Units (X-Axis)	HZ
	RPM (computed from Hz)
	ORDERS - Multiples of fundamental frequency.
Time Domain Units (X-Axis)	SEC, mSEC
	DEG - Computed from seconds-per-revolution when known, via tach option.

Amplitude Domain Units (X-Axis)

V pk - X-axis scaling and cursor readout values will be +/- peak Volts.

EU pk - X-axis scaling and cursor readout values will be +/- peak Engineering Units.

%FS - X-axis scaling and cursor readout values will be +/- percent of Full Scale.

NOTE

When displaying Amplitude Domain traces, unit will compute and display mean, sigma, skew and kurtosis of the signal. These readouts will appear on the top line of the display when enabled.

Special Spectrum Amplitude Units

For spectrum displays only, the Y-axis units can be adjusted by a "Y operator" so that V reads V^2, EU reads EU^2, etc.

Y Operator - Units, $Units^2$ $Units/Hz^{1/2}$ $Units^2/Hz$ (MAG, MAG^2, MSD, PSD). Result is rms spectrum, power spectrum, rms spectral density, power spectral density.

1-4.5 Functions Performed

Single Channel

Spectrum (Narrowband, Zoom or Octave Bands) from Real Time, Average or Storage Memories. Average or Storage Memory may contain Spectrum or Time data for these functions if Narrowband; Spectrum data only if Zoom or Octave Bands.

Narrow-Band Time - From Real Time, Average or Storage Memories. Only Time data in Average or Storage Memory to obtain Time display.

Zoom Time - Displays only real part of Zoom data from Real Time Memory.

Compressed Time Display - All 32768 Input Memory samples compressed into one display.

PDH (Probability Density Histogram; Narrowband only)
CD (Cumulative Distribution; Narrowband only)
From Real Time, Average or Storage Memories. Average or Storage Memory may contain PDH or Time data for these functions.

Two-Channel Functions

Each of the single channel functions can be designated to operate on Channel A or Channel B. The additional 2 channel functions are:

2 Channel Spectrum (Narrowband, Zoom or Octave). From Real Time, Average or Storage Memories. Average or Storage Memory may contain Spectrum, Cross Products (Narrowband or Zoom) or Narrowband Time data for these functions.

2 Channel Narrowband Time from Real Time, Average or Storage Memories. Only Time data in Average or Storage Memory to obtain Time display.

2 Channel Zoom Time from Real Time Memory. Displays only Real part of Zoom data.

2 Channel Compressed Time
Display all 32768 Input Samples

2 Channel PDH (Probability Density Histogram; Narrowband only)
2 Channel CD (Cumulative Distribution; Narrowband only)
From Real Time, Average or Storage Memories. Average or Storage Memory may contain PDH or Time data for these functions.

Transfer Function Magnitude and Phase (Narrowband or Zoom) from Cross Products or Time data in Average or Storage Memory.

Complex Transfer Function
Coherence
Coherent Output Power
Cross Spectrum Magnitude
Complex Cross Spectrum
> Narrowband or Zoom

Impulse Response
Output Response
Narrowband only
(From Cross Products data in Average or Storage Memory.)

Normalized Auto-Correlation
Normalized Cross-Correlation
Narrowband only

1-4.6 Averager

Domain	Averager will average Time Domain, Amplitude Domain or Frequency Domain data.
Modes	Summation, Exponential, Peak Test. (Peak Test maintains channel coherence if doing Cross Products average.)
Ensembles	Selectable from 1 to 2000.
Seconds	Selectable from 1 to 999. Number of seconds to sustain average.

Control	Start - Automatically clears Average Memory for new data. Continue - Continues average without clearing Average Memory. Stop - Stops average processing. Store - Transfers contents of Average Memory to Storage Memory.

1-4.7 Display

Size	Display is external (composite video; monochrome or RGB color compatible) monitor of any size selected by user, or optional EL display built into the unit lid.
Resolution	X-Axis 512 pixels Y-Axis 246 pixels
Traces	Single upper, single lower or dual. Intensity control pot for signal data traces on front panel. For bipolar (both) displays, trace control expands to include "Nyquist" or "Orbit" (upper versus lower) displays.
Single Channel Mixed Displays	Spectrum - RT & AVG, RT & STO, AVG & STO, 1-Channel Math (RT + AVG, RT - AVG, AVG - RT, RT x AVG, RT/AVG, AVG/RT) Time & Spectrum or Time & PDH - (Time can be regular Time or CTIM) CTIM & Time (CTIM = Compressed Time display) PDH - RT & AVG, RT & STO, AVG & STO CD - RT & AVG, RT & STO, AVG & STO

Two-Channel	Spectrum A & B
Mixed Displays	2-Channel Math (A + B, A - B, B - A, A x B, A/B, B/A) Time A & B PDH A & B CD A & B TF & Phase B/A TF real & imaginary B/A TF & Coherence B/A Cross Spectrum & Phase BA Coherence & COP B/A Cross Spectrum real & imag BA Auto Correlation RAA & RBB Cross Correlation RBA Impulse Response B/A Time A & Output Response B
X Gain	Lin-X1, -X2, -X4 or Log X
Y Gain	Lin X0.1 to X500 in a 1, 2, 4, 5 sequence Log -50dB to +50dB in 10dB steps
View Window	Selectable 80, 40 or 20dB log window
Grids	Electronically generated for non-parallax viewing of lin or log displays.
Grid Control	Frame only (with ticks), full frame with ticks off (full grids have lines intruding into trace area), or full frame with log ticks. Intensity control pot on front panel.
Scaling	Both X & Y grids fully annotated in user selected units. X grid annotation includes a dF, dT, dA (bandwidth) reading to indicate X units increment per cell.
Real Time Rate	4kHz typical. Up to 6kHz for Waterfall load.
Text Entry	Front panel entry of text in trace area for user report documentation.

1-4.8 Waterfall

Capacity	1 file of 200 records, or 2 files of 100 records, or 4 files of 50 records, or 8 files of 25 records.
Resolution	100, 200 or 400 lines. Waterfall data is trace data, so amplitude resolution is one part out of 200.
Display	Waterfall - 10, 25, 50 or 100 records Record Amplitude - 4, 8, 16, or 32 pixels Hidden line suppression ON/OFF Waterfall skew ON/OFF Single Record 1) Peak (each X-axis location scanned for peak amplitude in file). 2) Profile (profile of X location amplitudes; e.g., profile X-axis of records).
Waterfall File Load Control	Max - Take traces as fast as the analyzer calculates them. % Level - Takes records only if data is above amplitude designated by user (0 to 100%). Avg Recycle - Takes records only when average is complete. Includes automatically re-starting averager. +1 - Take one record when user presses Waterfall LOAD. dRPM (+,-) - Take records when rpm changes by user designated amount in user designated direction. dRPM (+ & -) - Same as dRPM (+,-) except direction is ignored.

NOTE

RPM update modes available only with SRA/TACH option installed. For acquisition to take place for both of the previous rpm modes, rpm must exceed user designated threshold.

Waterfall Cursor

1) Readouts include X and Y-axis in units acquired, record number, time of record, rpm of record.

2) Control includes X-axis control (move to new X location) and record control (move to new record).

1-4.9 Cursor

Control

Data cursor is controlled by front-panel CURSOR group buttons with arrows pointing left, right, up, down and FAST button.

Cursor SET - Used to set limits on cursor movement, e.g., dP rms summation, etc.

SET Turns on line cursor.
SET 1 Left Limit
SET 2 Right Limit
SET 3 Locks in harmonic fine tune.

Cursor MARK - Used to mark X-axis locations of interest. Up to 10 locations can be marked. When marked, X & Y readouts will be stored.

Modes for Analyzer Display

Normal - Single intensified dot at X - Y location of cursor.

Harmonic - Displays multiples of cursor fundamental with fine tune alignment.

Track - Cursor will automatically track maximum amplitude via three different algorithms:

TRK 1: Follows amplitude stable/unique peaks with any amount of frequency shift.

TRK 2: Follows frequency stable signals with large amplitude shifts or non-unique amplitudes.

TRK 3: Automatically places cursor at X location of largest amplitude in trace.

dP: Includes overall bar display at end of trace.

Readouts	X-Axis & Y amplitude for trace that the cursor is in. Two Y readouts if a dual trace display with common X-Axis calibration. In harmonic mode, X axis readout for fundamental reflects fractional cursor location "tuning" used to place the harmonic dots (e.g., more exact fundamental frequency readout). In dP mode, Y amplitude readout will include the overall dP reading. If Orbit or Nyquist display, cursor will readout vector sum of the two trace amplitudes, or the individual amplitudes of the two data blocks as indicated by the user.
Lists	MARK - Screen display of X - Y readouts recorded by cursor MARK. PEAK - Screen display of X - Y readouts of first 15 peaks found above or at amplitude of current cursor location. HARMONIC - Screen display of X - Y readouts of fundamental and orders of fundamental up to 15 orders. OCTAVE - Display of Octave band readouts (band number, CF, amplitude). Up to 15 bands displayed.

1-4.10 IEEE Specifications

IEEE 488 (78)	1) Functions implemented are SH1, AH1, T5, L4, SR1, RL0, PP0, DC1, DT0, C0 (or C1)
	2) Complete data, status and remote instrument control capability.
	3) In the controller mode the IEEE will operate any IEEE HP-GL compatible plotter and an HP "ThinkJet" Printer. This controller function is stand-alone (it is not capable of sharing control of the interface with any other controller).
	4) Plotter operation capability.
	5) "ThinkJet" operation will allow the operator to produce a copy of the NOMAD screen on the printer.

1-4.11 Front Panel Connections

Front Panel Button Matrix	
Channel A	BNC
Channel B	BNC
Tach Input	BNC
Conditioned Tach Output	BNC

1-4.12 Side Panel Connections

A. AC line power
B. IEEE-488
C. 8 position DIP switch providing:
    1) IEEE Device Address
    2) Video refresh rate (50 or 60 Hz)
    3) Self Test
D. Composite video BNC
E. RGB (color monitor) connector
F. External Sample Clock BNC

1-4.13 Miscellaneous

Operating Temperature	41°F to 122°F (5°C to 50°C) for basic unit 41°F to 104°F (5°C to 40°C) for units with EL Display Option and Disk Drive Option (either one or both).
Power	104 - 126 Vac, 47 - 63 Hz 207 - 253 Vac, 47 - 63 Hz (Consult factory for 400 Hz operation.)
Size	Height - 7.6" (19.30 cm) Width - 14.15" (39.94 cm) Depth - 22" (55.88 cm)
Weight	Less than 30 lbs (13.62 kg) for basic unit
Panel Store	User can store and recall up to six analyzer configurations in battery-backed CMOS RAM. Storage time with ac power removed is approximately 10 days.
Self Test	Unit provides internal self diagnostic for performance verification and service convenience.

1-4.14 Two Channel Option Specifications

Option is installable via the addition of circuit boards A4 and A6. A/B channel match specifications require factory installation or installation/calibration by qualified field service personnel.

Input specifications from headings 1-4.1, 1-4.2 and 1-4.3 apply to Channel B. All controls have the same affect on Channel B operation as on Channel A except:

Channel B has its own input level control.

Channel B has its own input coupling control.

Channel B delay is: Channel A delay + "B REL TO A DELAY" when acquiring both channels simultaneously.

Channel B will be updated when the user presses UPDATE unless a single channel function on Channel A is enabled.

NOTE

Channel A operation changes with 2 Channel option to the effect that Channel A will not be updated when single Channel B functions are enabled.

Channel A/B Matching for the 2 Channel Option	1) 0 to 0.8 full scale frequency (DC coupled); 2.5Hz to 0.8 full scale frequency (AC coupled): Amplitude match: +/- 0.3dB Phase match: +/- 1.5 deg 2) 0.8 to 1.0 full scale frequency: Amplitude match: +/- 1.0 dB Phase match: +/- 3.0 deg

1-4.15 SRA/Tach Option Specifications

Option is field installable via installation of a circuit card (position A2).

Tach Input:

Range	1 Hz to 10kHz (60 to 600,000 pulses/min).
Coupling	ac only
Polarity	Positive (negative for 10% or less duty cycle pulses)
Pulse Amplitude Range	300mVpk to 80Vpk, with AGC control
Minimum Pulse Width	10us or 0.1% of the total tach period, whichever is greater
Input Impedance	65kohms

Tach Readout & Control:

RPM Readout Accuracy	From 60 to 60,000 rpm, 0.5%; from 60,000 rpm to 600,000 rpm, 1.0%
Tach Pulses Per Revolution	Programmable from .0001 to 99,999.

SRA Operation:

1) Operator can select A/D sampling from the SRA (instead of the crystal controlled internal sample clock).

2) The SRA will produce a sample clock proportional to the TACH period in accordance with the PPR and full scale orders entered by the user.

3) When tach period is within the range of the SRA settings, the SRA option will generate a sample clock that will follow (with some tracking delay when the period is changing) the tach. This results in signal frequencies at the RPM and order multiples of the RPM always falling in the same FFT bins. Data is alias free. When tach falls outside of range, the unit will display an error message to that effect.

4) SRA ranges - the effective rpm range of the SRA is determined by menu selection. Note that the analysis range of the unit is actually full scale rpm (RPM x full scale orders). Therefore, selected rpm range is not the rpm input; it is rpm input x full scale orders.

Full Scale RPM Range
240k to 480k
120k to 240k
20k to 120k
10k to 60k
1.25k to 30k
625 to 15k
315 to 7.5k
155 to 3.75k

(SRA cannot track above full-scale rpm of 480,000)

In Sync Spectrum, with SRA sampling and external repeat trigger, the phase readout at the vibration fundamental will be referenced to the leading edge trigger of the tach signal within the limits of accuracy obtainable for the FFT bin. The signal is in for +/- two samples. A full scale orders selection of 20 is recommended when phase data is used in this Sync Spectrum mode.

NOTE

SRA rpm ranges are limited to a tach input of 5 Hz to 10kHz. If tach range required to track the indicated rpm range is outside these limits, the analyzer will prompt the user.

1-4.16 Data Storage Option Specifications

The Data Storage Option consists of a built-in disk drive and is not field installable.

Media Requirements	Removable, dual-sided, double-density, 3-1/2 inch micro-floppy disk.
Disk Capacity	Formatted: 737,280 Bytes
Directory Capacity	255 files per disk
List	File number and File ID in 24 characters or less.

Data Storage Capacity

Function	Files Per Disk
Single channel, 400-line averaged spectrum data	255
Single channel 1024 pt. time blocks	255
2 channel 400-line TF, Phase and Coherence	80
100 record Waterfall files	15
32k Sample Input Memory	9

File Types: Front-panel setups, Analyzer processed data, Regular Input Memory or Compressed Time data, Waterfall files. Text is included as part of each file except front-panel setup files.