Operator's Manual
SD385 NOMAD Portable Signal Analyzer
Part Five

Legacy Manual

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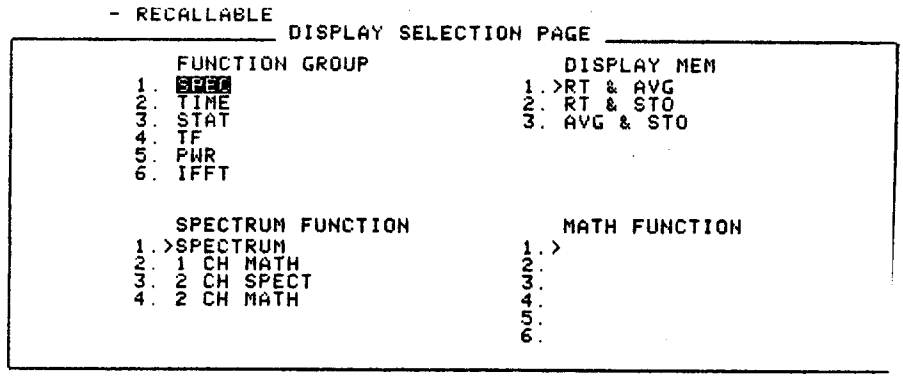
DISPLAY
SELECTION CONTROL
(Setup Page 3)

3-3.3 Setup Page 3 - DISPLAY SELECTION PAGE

This Setup Page is where the Primary Functions performed by the SD385 are selected. These are: Spectrum (SPEC), Time (TIME), Statistics (STAT) and, if you have a two channel instrument, Transfer Function (TF), Power (PWR), and Inverse Fast-Fourier Transform (IFFT) as well as the additional Spectrum, Time and Statistics two-channel functions.



Operation of this setup page is slightly different than the other setup pages. Refer to Figure 3-DISP-1 and note that there are four separate menus and one RV. Selection within a menu, just as with previous menus, is accomplished using the SCROLL group UP/DOWN buttons. Moving the RV from one menu to another is accomplished using the SETUP group UP/DOWN and LEFT/RIGHT buttons. Also note in Figure 3-DISP-1 that on the three menus without the RV, there are pointers (actually they're "greater than" symbols) indicating the current selections on these menus. When the RV is moved from one menu to another, the RV will go to the selection with the pointer. In addition, these selections indicate what is actually being displayed. For example, the setup page and data display shown in Figure 3-DISP-1 indicates the following: The selected FUNCTION GROUP (primary function) is SPEC, the selected SPECTRUM FUNCTION is SPECTRUM (a single-channel function), the selected DISPLAY MEM is RT & AVG, a dual display (same channel) of the contents of the Input Memory (RT) and the Average Memory (AVG).

As previously noted, the example is a dual trace display allowing you to view the contents of the two selected memories simultaneously. Display trace selection is accomplished using the SEL TRACE button located in the SCROLL group. Located just to the left of the SEL TRACE button are two LED's. These LED's indicate the display trace format. If both LED's are lit, a dual display format is selected. If just the upper LED is lit, the display example in Figure 3-DISP-1 would be a single trace display of the contents of the Input Memory (RT) only. If just the lower LED is lit, the example would be a single trace display of the contents of the Average Memory (AVG) only.

If you place the RV on the SPECTRUM FUNCTION menu and move it from on selection to another (e.g., SPECTRUM, 1 CH MATH, 2 CH SPEC, 2 CH MATH) you will notice that both the DISPLAY MEM menu and the MATH FUNCTION menu will change with each function change and these menus will vary in content. The same thing happens with all the FUNCTION menus.

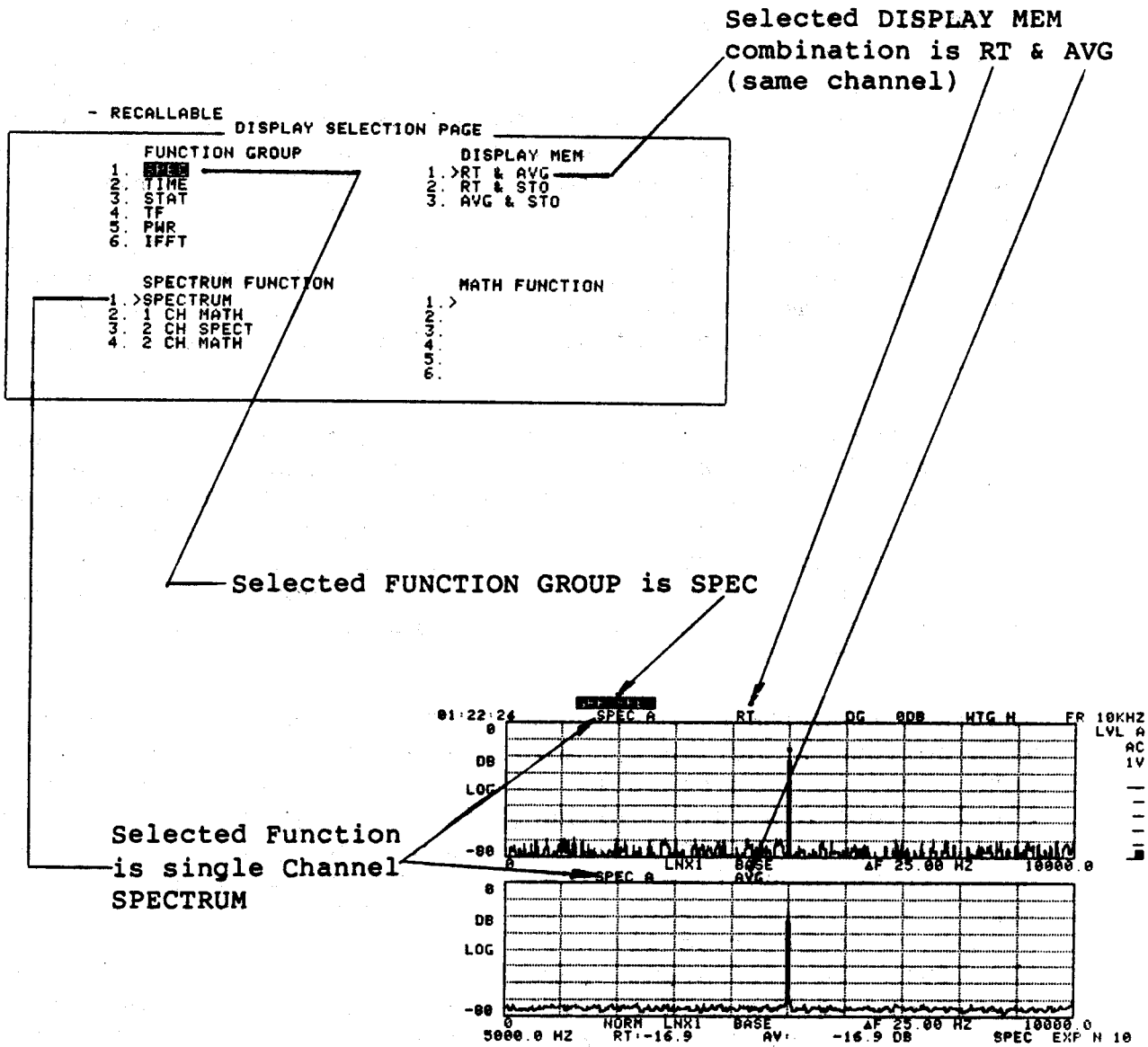


Figure 3-DISP-1. Operation of Setup Page 3 DISPLAY SELECTION PAGE

Function Group - SPECTRUM

Refer to the first item on the SPECTRUM FUNCTION menu, SPECTRUM. This is a single channel function that provides a dual display of the same channel of data from two separate sources. The source of the data is determined by the DISPLAY MEM Menu selection associated with this function. Any one of three different dual display combinations (RT & AVG, RT & STO and AVG & STO) can be selected from the DISPLAY MEM menu, or any single trace can be selected (front-panel SEL TRACE button). RT (Real Time) refers to FFT'd Spectrum data from the Input Memory. AVG (Average) refers to Averaged Spectrum data from the Average Memory, and STO (Store) refers to Averaged Spectrum data that has been placed in the Storage Memory.

When a two-channel function is selected, the contents of only one type of memory at a time can be displayed. For example, if you select 2 CH SPECT from the SPECTRUM FUNCTION menu and STO from the DISPLAY MEM menu, the upper trace will be Channel A Storage Memory and the lower trace will be Channel B Storage Memory (each channel has its own Input, Average and Storage Memory). No combination memory displays for two channel functions.

SPECTRUM FUNCTION selections 2 (1 CH MATH) and 4 (2 CH MATH), when selected, activate the MATH FUNCTION menu. When either math function is selected, the results will always be a single trace display. Although the math operations for both functions are identical (i.e., upper trace plus lower trace, upper trace minus lower trace, lower trace minus upper trace, upper trace times lower trace, upper trace divided by lower trace and lower trace divided by upper trace), the source of the data is different resulting in a variation in the appearance of the MATH FUNCTION menu. For example, when 1 CH MATH is selected, the math functions are performed on a single channel of data from two different memories (e.g., Channel A Average Memory data plus Channel A Storage Memory data). When 2 CH MATH is selected, the math functions are performed on two separate channels from the same type of memory (e.g., Channel A Average Memory data plus Channel B Average Memory data). The memory combinations, and the appearance of the MATH FUNCTION menu, depend upon the DISPLAY MEM menu selection. For the single channel math functions (1 CH MATH) the MATH FUNCTION menu will reflect the DISPLAY MEM menu selection as follows:

DISPLAY MEM	MATH FUNCTION
1. >RT & AVG	1. >RT + AVG (Input Mem + Average Mem)
2. RT & STO	2. RT - AVG (Input Mem - Average Mem)
3. AVG & STO	3. AVG - RT (Average Mem - Input Mem)
	4. RT x AVG (Input Mem x Average Mem)
	5. RT/AVG (Input Mem/Average Mem)
	6. AVG/RT (Average Mem/Input Mem)

DISPLAY MEM	MATH FUNCTION
1. RT & AVG	1. >RT + STO (Input Mem + Storage Mem)
2. >RT & STO	2. RT - STO (Input Mem - Storage Mem)
3. AVG & STO	3. STO - RT (Storage Mem - Input Mem)
	4. RT x STO (Input Mem x Storage Mem)
	5. RT/STO (Input Mem/Storage Mem)
	6. STO/RT (Storage Mem/Input Mem)

DISPLAY MEM	MATH FUNCTION
1. RT & AVG	1. >AVG + STO (Average Mem + Storage Mem)
2. RT & STO	2. AVG - STO (Average Mem - Storage Mem)
3. >AVG & STO	3. STO - AVG (Storage Mem - Average Mem)
	4. AVG x STO (Average Mem x Storage Mem)
	5. AVG/STO (Average Mem/Storage Mem)
	6. STO/AVG (Storage Mem/Average Mem)

When 2 CH MATH is selected, the math is performed on the two separate channels from the same type of memory. For example:

DISPLAY MEM	MATH FUNCTION
1. >RT	1. >A + B (CH A Input Mem + CH B Input Mem)
2. AVG	2. A - B (CH A Input Mem - CH B Input Mem)
3. STO	3. B - A (CH B Input Mem - CH A Input Mem)
	4. A x B (CH A Input Mem x CH B Input Mem)
	5. A/B (CH A Input Mem/CH B Input Mem)
	6. B/A (CH B Input Mem/CH A Input Mem)

DISPLAY MEM	MATH FUNCTION
1. RT	1. >A + B (CH A Average Mem + CH B Average Mem)
2. >AVG	2. A - B (CH A Average Mem - CH B Average Mem)
3. STO	3. B - A (CH B Average Mem - CH A Average Mem)
	4. A x B (CH A Average Mem x CH B Average Mem)
	5. A/B (CH A Average Mem/CH B Average Mem)
	6. B/A (CH B Average Mem/CH A Average Mem)

	DISPLAY MEM	MATH FUNCTION
1.	RT	1. >A + B (CH A Storage Mem + CH B Storage Mem)
2.	AVG	2. A - B (CH A Storage Mem - CH B Storage Mem)
3.	>STO	3. B - A (CH B Storage Mem - CH A Storage Mem)
		4. A x B (CH A Storage Mem x CH B Storage Mem)
		5. A/B (CH A Storage Mem/CH B Storage Mem)
		6. B/A (CH B Storage Mem/CH A Storage Mem)

Another important item that has a direct affect on the results of the math operations are the selected Y Units and Y Units Operator. Refer to Table 3-DSP/SEL-1 and note that the first column lists the available Y Units. the second column lists the available Y Units Operator. The items in the first two columns come from two menus located on Setup Page 4. The third column lists the effect these two menu selections have on the displayed Y units as well as the displayed data (the effect the Y Units Operator has on the displayed data will be discussed later. Columns 4, 5, 6 and 7 list the math operations and the variations resulting from both the selected Y Units and Y Units Operator. Included with the table are illustrations showing one example of each math operation. These selections were made for the following illustrations: Single channel SPECTRUM, CH A, RT & AVG, dB Y Units and MAG Y Units Operator. The first illustration is a dual display of the two blocks of data used for the math calculations. All the calculations were performed on the same two blocks of data.

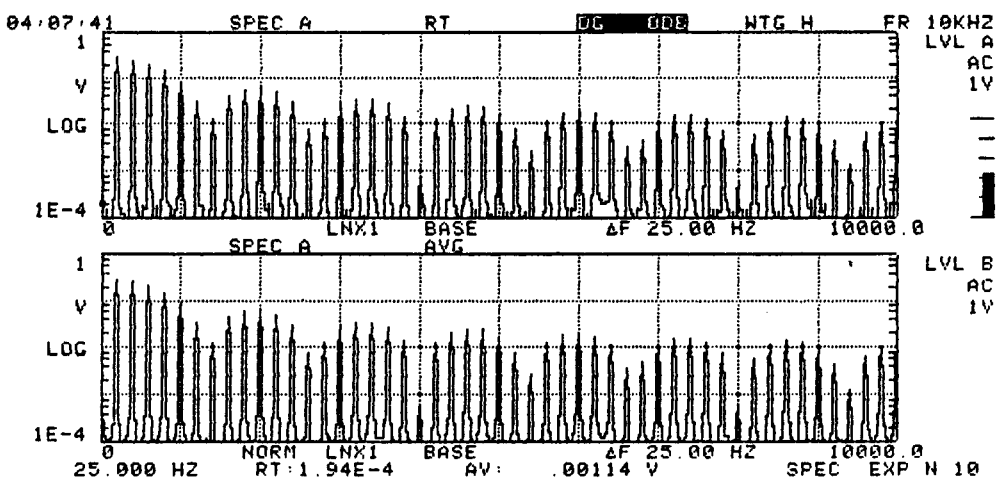


Figure 3-DSP/SEL-2. Dual-Trace, Single-Channel Display of Real Time (RT) and Averaged (AVG) Data used for the Math Operations.

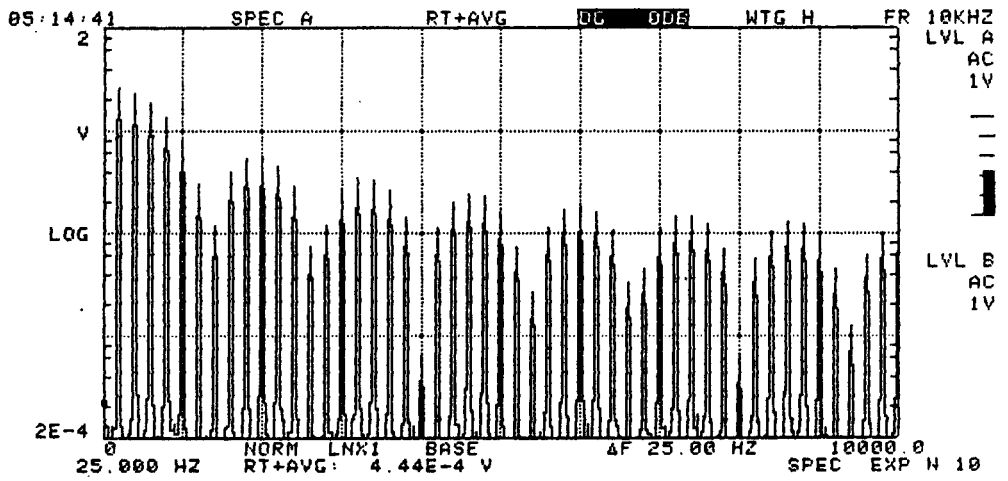


Figure 3-DSP/SEL-3. MATH FUNCTION Menu Selection 1, RT + AVG; i.e., Upper Trace, Real Time Spectrum Data Added to the Lower Trace, Average Spectrum Data

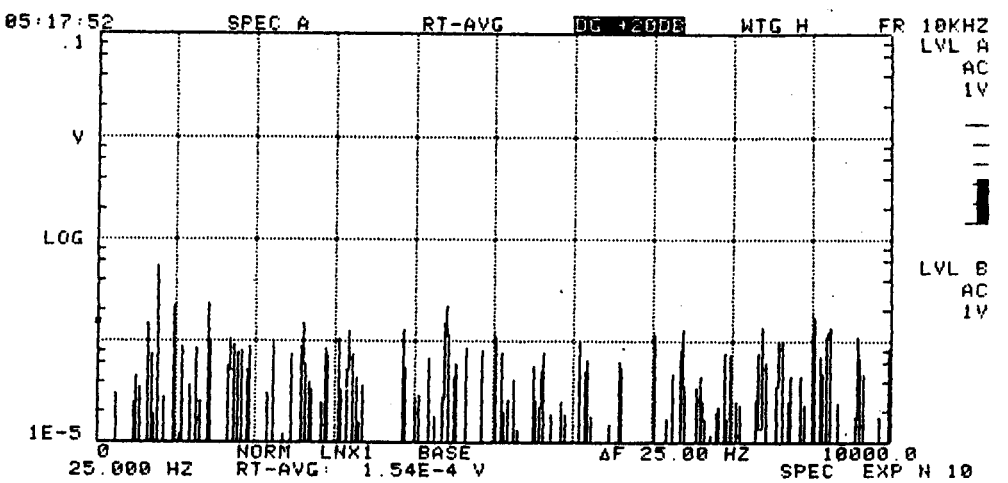


Figure 3-DSP/SEL-4. MATH FUNCTION Menu Selection 2, RT - AVG; i.e., Upper Trace, Real Time Spectrum Data Minus the Lower Trace Averaged Spectrum Data

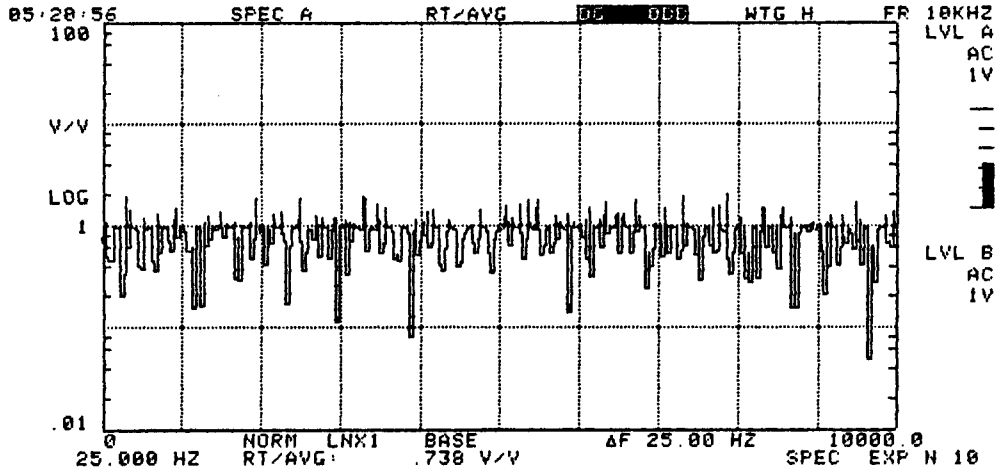


Figure 3-DSP/SEL-7. MATH FUNCTION Menu Selection 5, RT/AVG; i.e., Upper Trace, Real Time Spectrum Data Divided by the Lower Trace, Averaged Spectrum Data

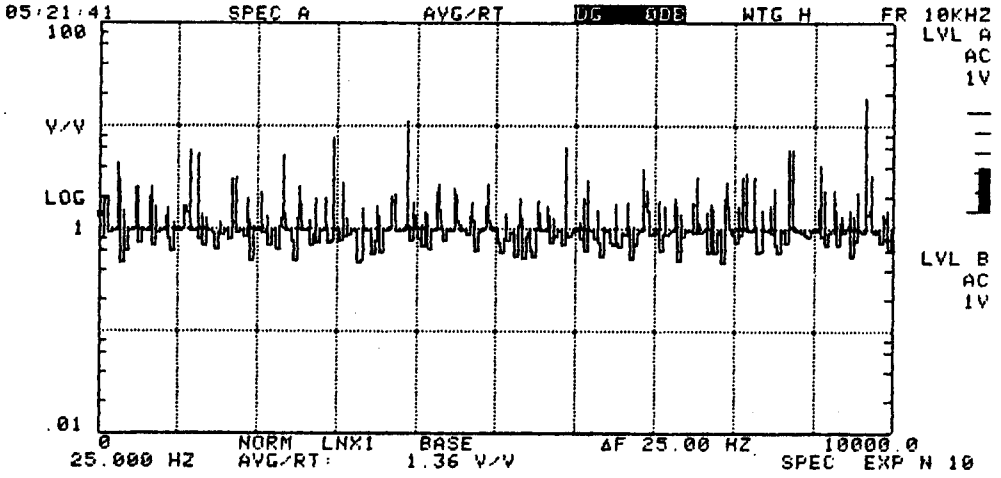


Figure 3-DSP/SEL-8. MATH FUNCTION Menu Selection 6, AVG/RT; i.e., Lower Trace, Averaged Spectrum Data Divided by the Upper Trace, Real Time Spectrum Data

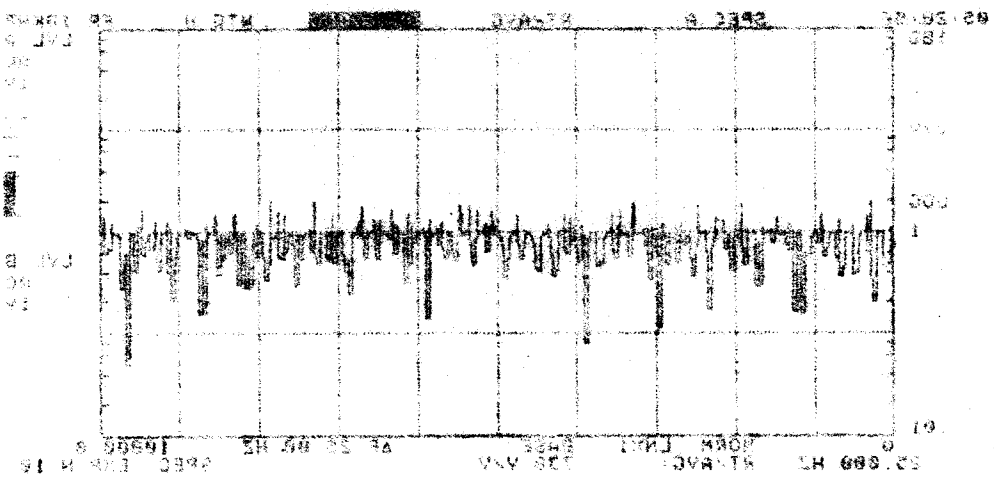


Figure 3-DSP/SEL-7. MATH FUNCTION Menu Selection 5, RT/AVG; i.e., Upper Trace, Real Time Spectrum Data Divided by the Lower Trace, Averaged Spectrum Data .

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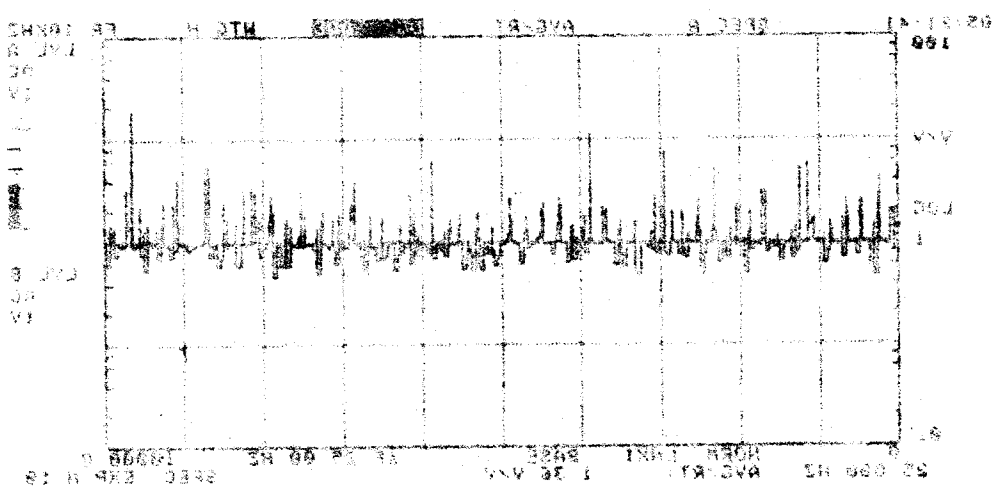

Figure 3-DSP/SEL-8. MATH FUNCTION Menu Selection 6, AVG/RT; i.e., Lower Trace, Averaged Spectrum Data Divided by the Upper Trace, Real Time Spectrum Data

Y UNITS	Y UNITS OPERATOR	RESULTANT Y UNITS (DISPLAYED)
V	MAG	V
	MAG^2	V^2
	MAG/√Hz	V/√Hz
	MAG^2/Hz	V^2/Hz
	*	V/V
EU	MAG	EU
	MAG^2	EU^2
	MAG/√Hz	EU/√Hz
	MAG^2/Hz	EU^2/Hz
	*	EU/EU
dB	MAG	DB (MAG)
	MAG^2	DB (MAG^2)
	MAG/√Hz	DB/√Hz
	MAG^2/Hz	DB (MAG^2)/Hz
	*	DB (GAIN)
dBV	MAG	DBV (MAG)
	MAG^2	DBV (MAG^2)
	MAG/√Hz	DBV/√Hz
	MAG^2/Hz	DBV/Hz
	*	DBV (GAIN)
dBR	MAG	DBR (MAG)
	MAG^2	DBR (MAG^2)
	MAG/√Hz	DBR/√Hz
	MAG^2/Hz	DBR/Hz
	*	DBR (GAIN)

KEY

√Gxx
√Gyy
uared" ⇔ Gxx
uared" ⇔ Gyy
cted For S_1
cted For S_2
ference 1 For S_1
ference 2 For S_2
ng Units (EU) For S_1
ng Units (EU) For S_2
of the Two But Not Both
Δf
lts To MAG/MAG for Ratio & Transfer Function

F_2" refer to that voltage which yields 0.0 dB in the
(from Setup Page 5):

X db @ Y Volts

e.g.,

(Y/"RF_1") = X

(Y/"RF_1") = X/20

Y/"RF_1" = $10^{\frac{X}{20}}$

"RF_1" = $Y/10^{\frac{X}{20}}$

dB@

@ Vref

Table 3-DSP/SEL-1. Spectrum Math
3-DSP/SEL-11/3-DSP/SEL-12

Table

Y UNITS	Y UNITS OPERATOR	RESULTANT Y UNITS (DISPLAYED)	SUM MATH FUNCTION MENU SELECTION 1 UP + LO	D MAT MENU S UP -
V	MAG	V	$S_1 + S_2$	
	MAG^2	V^2	$(S_1)^2 + (S_2)^2$	
	MAG/$\sqrt{Hz}$	V/$\sqrt{Hz}$	$(S_1 + S_2)/\sqrt{BW}$	
	MAG^2/Hz	V^2/Hz	$[(S_1)^2 + (S_2)^2]/BW$	[(
	*	V/V	—	
EU	MAG	EU	$E_1 + E_2$	
	MAG^2	EU^2	$(E_1)^2 + (E_2)^2$	
	MAG/$\sqrt{Hz}$	EU/$\sqrt{Hz}$	$(E_1 + E_2)/\sqrt{BW}$	
	MAG^2/Hz	EU^2/Hz	$[(E_1)^2 + (E_2)^2]/BW$	[(
	*	EU/EU	—	
dB	MAG	DB (MAG)	$20 \text{ LOG} \left(\frac{S_1 + S_2}{L_1 + L_2} \right)$	20 LO
	MAG^2	DB (MAG^2)	$10 \text{ LOG} \left[\frac{(S_1)^2 + (S_2)^2}{(L_1)^2 + (L_2)^2} \right]$	10 LO
	MAG/$\sqrt{Hz}$	DB/$\sqrt{Hz}$	$20 \text{ LOG} \left(\frac{S_1 + S_2}{L_1 + L_2} \Big/ \sqrt{BW} \right)$	20 LOG (
	MAG^2/Hz	DB (MAG^2)/Hz	$10 \text{ LOG} \left[\frac{(S_1)^2 + (S_2)^2}{(L_1)^2 + (L_2)^2} \Big/ BW \right]$	10 LOG
	*	DB (GAIN)	—	
dBV	MAG	DBV (MAG)	$20 \text{ LOG} \left(\frac{S_1 + S_2}{1.0} \right)$	20 LO
	MAG^2	DBV (MAG^2)	$10 \text{ LOG} \left[\frac{(S_1)^2 + (S_2)^2}{1.0} \right]$	10 LO
	MAG/$\sqrt{Hz}$	DBV/$\sqrt{Hz}$	$20 \text{ LOG} \left(\frac{S_1 + S_2}{\sqrt{BW}} \right)$	20 LO
	MAG^2/Hz	DBV/Hz	$10 \text{ LOG} \left[\frac{(S_1)^2 + (S_2)^2}{BW} \right]$	10 LO
	*	DBV (GAIN)	—	
dBR	MAG	DBR (MAG)	$20 \text{ LOG} \left(\frac{S_1 + S_2}{RF_1} \right)$	20 LO
	MAG^2	DBR (MAG^2)	$10 \text{ LOG} \left[\frac{(S_1)^2 + (S_2)^2}{(RF_1)^2} \right]$	10 LO
	MAG/$\sqrt{Hz}$	DBR/$\sqrt{Hz}$	$20 \text{ LOG} \left(\frac{S_1 + S_2}{RF_1} \Big/ \sqrt{BW} \right)$	20 LOG (
	MAG^2/Hz	DBR/Hz	$10 \text{ LOG} \left[\frac{(S_1)^2 + (S_2)^2}{(RF_1)^2} \Big/ BW \right]$	10 LOG
	*	DBR (GAIN)	—	

EL-1. Spectrum Math

PRODUCT ATH FUNCTION IU SELECTION 4 UP x LO	RATIO MATH FUNCTION MENU SELECTIONS 5 & 6 UP/LO & LO/UP
—	—
$S_1 \times S_2$	—
—	—
$(S_1 \times S_2)/BW$	
—	S_1/S_2
—	—
$E_1 \times E_2$	—
—	—
$(E_1 \times E_2)/BW$	—
—	E_1/E_2
—	—
$\left(\frac{S_1 \times S_2}{L_1 \times L_2}\right)$	—
—	—
$\left(\frac{S_1 \times S_2}{L_1 \times L_2} / BW\right)$	—
—	$20 \text{ LOG } \left[\frac{(S_1/S_2)}{(L_1/L_2)}\right]$
—	—
$\left(\frac{S_1 \times S_2}{1.0}\right)$	—
—	—
$\left(\frac{S_1 \times S_2}{BW}\right)$	—
—	$20 \text{ LOG } (S_1/S_2)$
—	—
$\left(\frac{S_1 \times S_2}{RF_1 \times RF_2}\right)$	—
—	—
$\left(\frac{S_1 \times S_2}{RF_1 \times RF_2} / BW\right)$	—
—	$20 \text{ LOG } \left(\frac{S_1/S_2}{RF_1/RF_2}\right)$

KEY

S_1 = Spectrum 1 $\Leftrightarrow \sqrt{Gxx}$
S_2 = Spectrum 2 $\Leftrightarrow \sqrt{Gyy}$
$(S_1)^2$ = Spectrum 1 "Squared" $\Leftrightarrow$ Gxx
$(S_2)^2$ = Spectrum 2 "Squared" $\Leftrightarrow$ Gyy
L_1 = Input Level 1 Selected For S_1
L_2 = Input Level 2 Selected For S_2
RF_1 = User-Entered Reference 1 For S_1
RF_2 = User-Entered Reference 2 For S_2
E_1 = Selected Engineering Units (EU) For S_1
E_2 = Selected Engineering Units (EU) For S_2
L_1 or L_2 = The Greater of the Two But Not Both
BW = Bandwidth $\Leftrightarrow \Delta f$
*Y Units Operator Defaults To MAG/MAG for Ratio & Transfer Function

The terms "RF_1" and "RF_2" refer to that voltage which yields 0.0 dB in the user-entered relationship (from Setup Page 5):

X db @ Y Volts

e.g.,

$$20 \log (Y/\text{"}RF_1\text{"}) = X$$

$$\rightarrow \log (Y/\text{"}RF_1\text{"}) = X/20$$

$$\rightarrow Y/\text{"}RF_1\text{"} = 10^{\frac{X}{20}}$$

$$\rightarrow \text{"}RF_1\text{"} = Y/10^{\frac{X}{20}}$$

dB@
@ Vref

Table 3-DSP/SEL-1. Spectrum Math
3-DSP/SEL-11/3-DSP/SEL-12

Figures 3-DSP/SEL-9 through 3-DSP/SEL-13 are basic examples of each SPECTRUM FUNCTION Menu Selection. Figures 3-DSP/SEL-9 and 3-DSP/SEL-10 are both examples of selection 1, SPECTRUM, showing the lower trace before and after an average is performed.

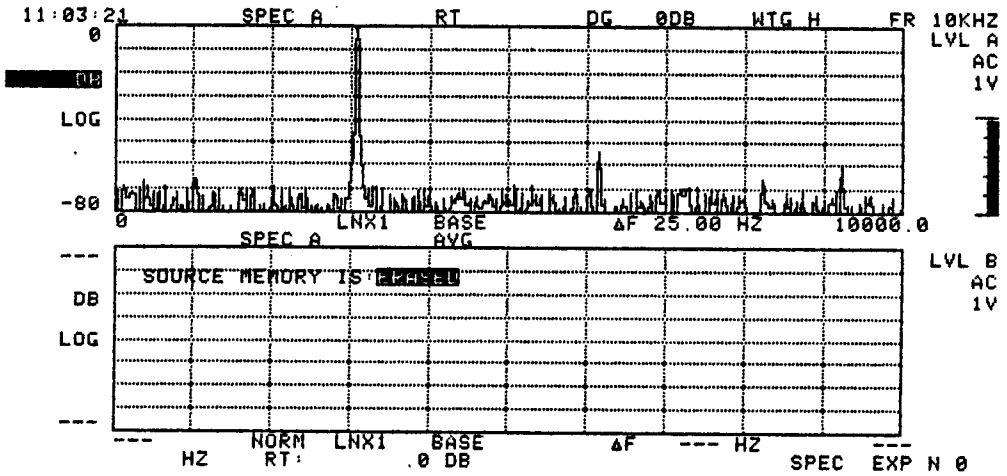

Figure 3-DSP/SEL-9. SPECTRUM FUNCTION Menu selection 1, SPECTRUM This is how the Lower Trace Appears before an Average is Performed.

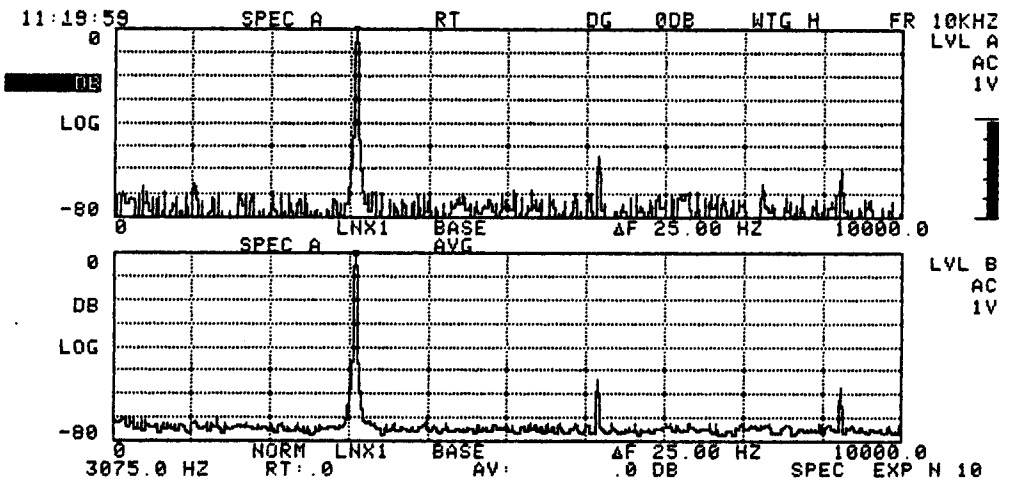

Figure 3-DSP/SEL-10. SPECTRUM FUNCTION Menu Selection 1, SPECTRUM. This is how the Lower Trace Appears after an Average is Performed.

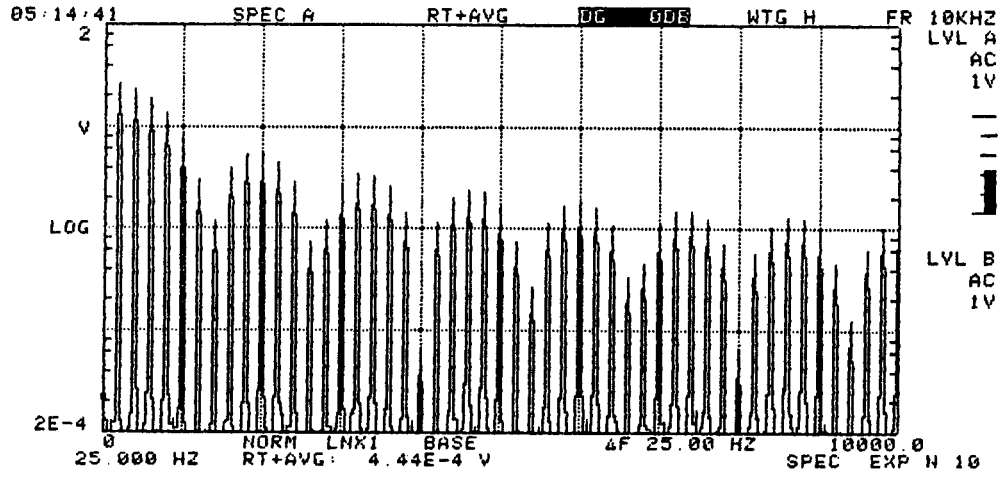

Figure 3-DSP/SEL-11. SPECTRUM FUNCTION Menu Selection 2, 1 CH MATH

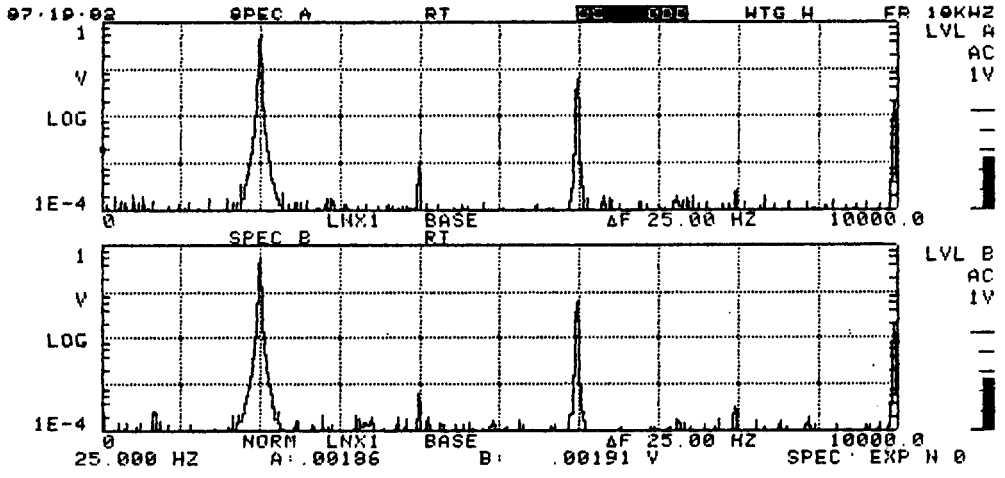

Figure 3-DSP/SEL-12. SPECTRUM FUNCTION Menu Selection 3, 2 CH SPECT

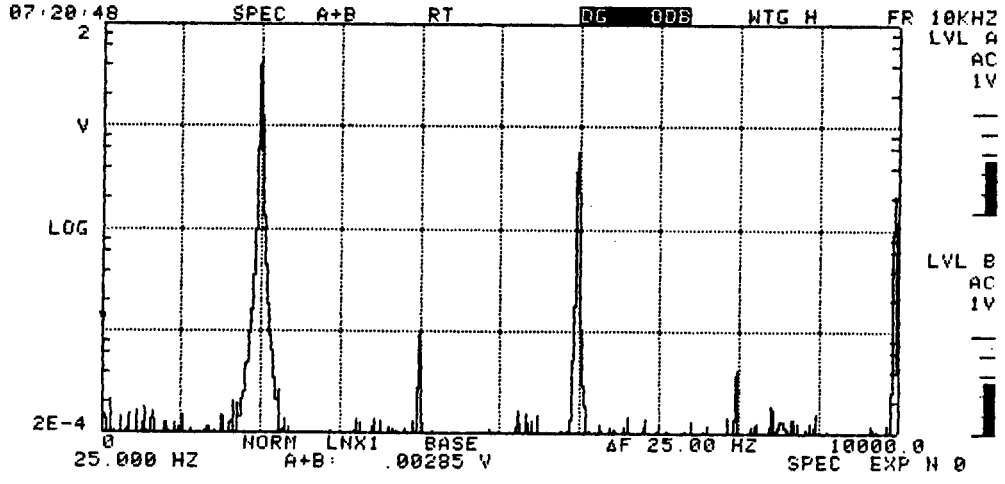

Figure 3-DSP/SEL-13. SPECTRUM FUNCTION Menu Selection 4, 2 CH MATH

Function Group - Time

Refer to the first item on the TIME FUNCTION menu, TIME & SPEC. This is a single channel function displaying the same data in two different formats; i.e., Time Domain data and Frequency Domain (Spectrum) data. The selected function (TIME & SPEC) determines which data ends up in which trace. The upper trace is always Time Domain data, the lower trace is always Frequency Domain (Spectrum) data. Look at the DISPLAY MEM Menu associated with this function, and notice the selections on the DISPLAY MEM Menu follow this sequence. The first item on each of the three selections (INP) refers to the Input Memory. What this means is the upper trace data is always the filtered, digitized, Time-Domain waveform from the Input Memory. the second item on each of the three selections (RT, AVG, STO) refers to the source of the Frequency Domain (SPECTRUM) data. Real Time RT refers to FFT'd Spectrum data from the Input Memory. AVERAGE (AVG) refers to Averaged Spectrum data from the Average Memory, and stored (STO) refers to Averaged Spectrum data that has been placed in the Storage Memory. The Spectrum data, regardless of its source, is always the lower trace data.

Menu item 2, TIME & PDH, is a single channel function displaying the same data in two different formats; i.e., Time Domain data and Amplitude Domain (Statistical) data. Look at the DISPLAY MEM menu associated with this function, and notice it is identical to the DISPLAY MEM menu for selection 1. Here again , the upper trace data is always the filtered, digitized, Time-Domain waveform from the Input Memory (INP). The lower trace is always Amplitude Domain data with the sources for the lower trace display data being the Input Memory (RT), the Average Memory (AVG) or the Storage Memory (STO).

Before continuing, a few words concerning averaging Time Domain data are in order. If you look at the DISPLAY MEM menus for the first two selections (TIME & SPEC, TIME & PDH), you will notice the Display Memory for the upper-trace Time Domain data is always INP. To select and display averaged Time Domain data, select TIME on the AVERAGE DATA menu. This menu is located on Setup Page 2. However, in addition to Time-data averaging capability, selecting TIME on the AVERAGE DATA menu causes several interesting things to take place. First, Time-data averaging isn't confined to just the time Functions. Time-data averaging can be selected for the Spectrum Functions, the Statistical Functions and menu item 1 on the TRANSFER FUNCTION menu ($|TF|$ & ϕ), as well.

The next thing that takes place are display annotation and menu changes. When Time-data averaging is selected, the display annotation indicating the selected function has the term SYNC added to it; e.g., TIME A becomes SYNC TIME A, SPEC A becomes SYNC SPEC A, PDH A becomes SYNC PDH A, |TF| B/A becomes SYNC |TF| B/A, etc. The DISPLAY MEM menus that accompany TIME FUNCTION menu items 1 and 2 now read: 1. INP, 2. AVG, 3. STO instead of: 1.INP & RT, 2. INP & AVG, 3. INP & STO.

When the AVERAGE DATA mode is TIME, the selected function (i.e., SYNC SPECTRUM, SYNC CD, etc.) will be performed on the time-averaged data from the Average Memory. For example, SYNC SPECTRUM is an FFT of, and SYNC CD is the CD of time-averaged data. Only time-data is averaged in this mode.

Menu item 3, CTIME & TIM, provides the capability of viewing the same channel of Time Domain data in a compressed and non-compressed mode (compressed refers to the entire contents of the Input Memory). Again, the selected function determines which data ends up in which trace. The upper trace is always Compressed Time data and the lower trace is always non-compressed Time Domain data. The data displayed in the lower trace is that portion of the Input Memory designated by the location and the width of the block cursor located on the upper trace. The width of the block cursor is determined by the selected Lines-of-Resolution and is equal to one standard memory period. This allows you to view the entire contents of the Input Memory, one memory period at a time, by stepping through the Input Memory using the block cursor. Movement of the block cursor is controlled by the INPUT MEMORY group LEFT/RIGHT buttons only when Compressed Time is selected.

Before continuing, a few more items concerning Compressed Time data should be mentioned. First, the Compressed Time feature can be used with all the selections on the TIME FUNCTION menu. However, in order to display the entire contents of the Input Memory (like the upper trace for CTIME & TIME), Compressed X-axis (CMPRSD) has to be selected (it is selected automatically for the upper trace when CTIME & TIM is selected). Compressed X-axis is selected via the X-AXIS menu located on Setup Page 4. However, CTIME & TIM is the only selection where the same data can be viewed in both a compressed and non-compressed mode.

For menu item 4, 2 CH TIME, the selected two-channel combination determines which data ends up in which trace. For the two-channel option, Channel A is always upper trace and Channel B is always lower trace.

With the exception of the first two function selections (TIME & SPEC, TIME & PDH), the contents of only one type of memory at a time can be displayed. For example, if you select 2 CH TIME, and STO from the DISPLAY MEM menu both will be the contents of the 2 available Storage Memories (each channel has its own Input, Average and Storage Memory). Combination memory displays for the 2 channel functions cannot be selected.

Figures 3-DSP/SEL-14 through 3-DSP/SEL-17 are basic examples of each TIME FUNCTION menu selection.

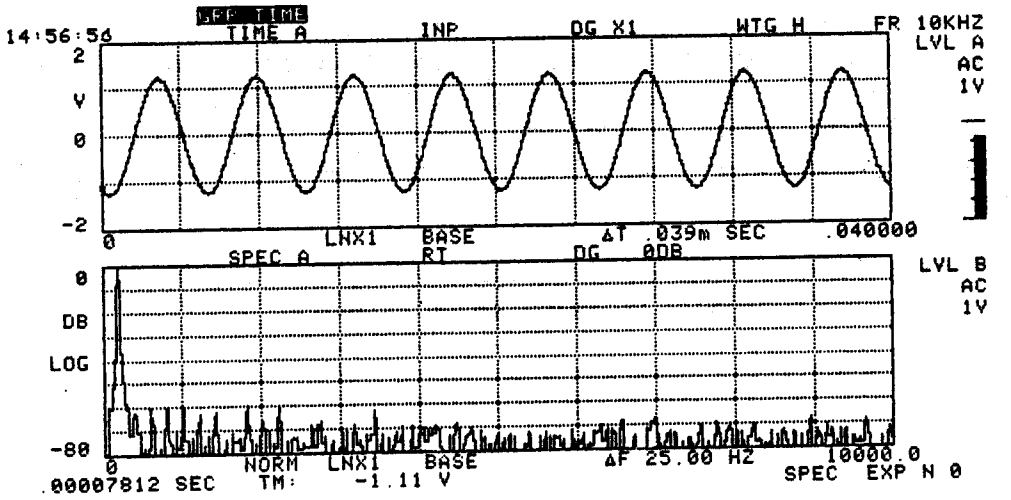

Figure 3-DSP/SEL-14. TIME FUNCTION Menu Selection 1, TIME & SPEC

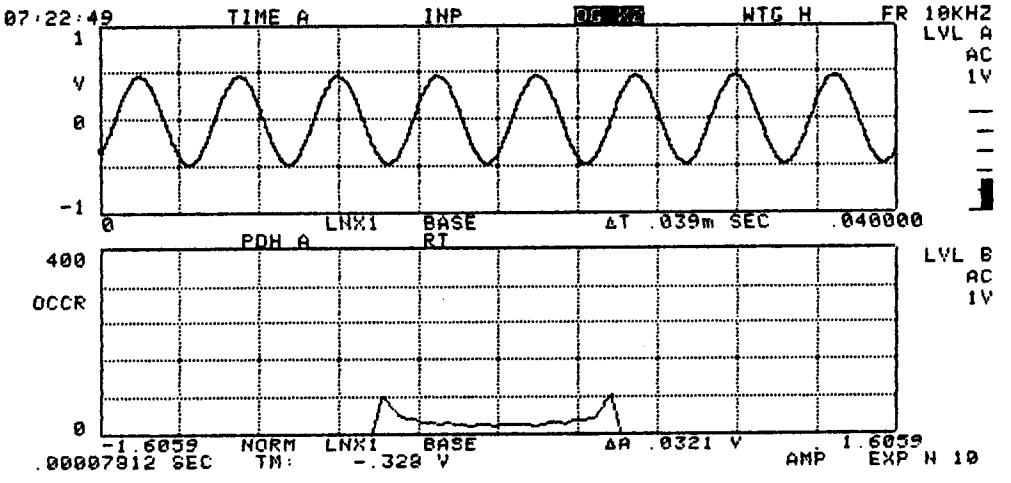

Figure 3-DSP/SEL-15. TIME FUNCTION Menu Selection 2, TIME & PDH

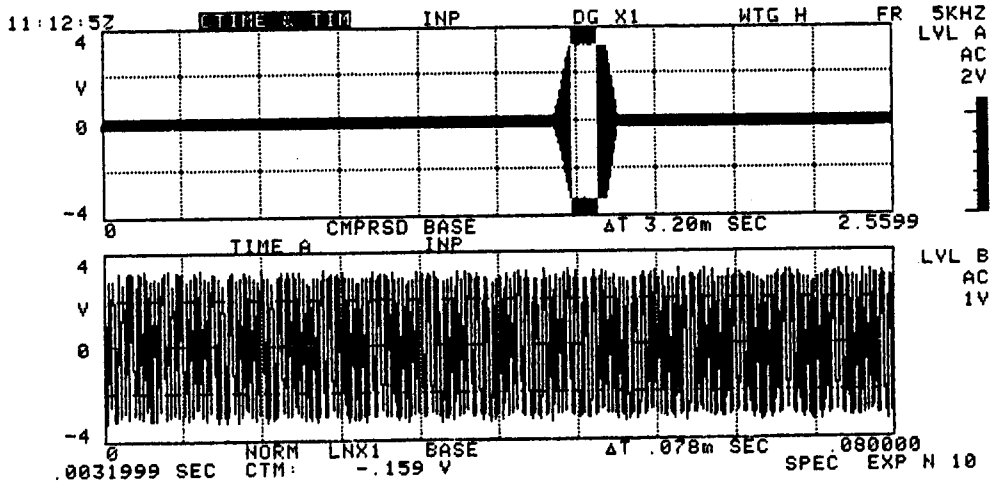

Figure 3-DSP/SEL-16. TIME FUNCTION Menu Selection 3, CTIME & TIME

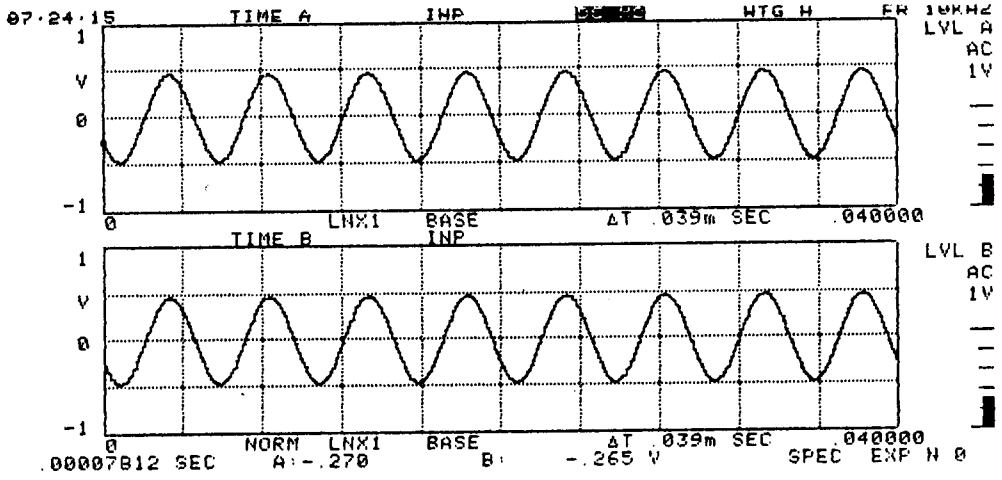

FIGURE 3-DSP/SEL-17. TIME FUNCTION Menu Selection 4, 2 CH TIME

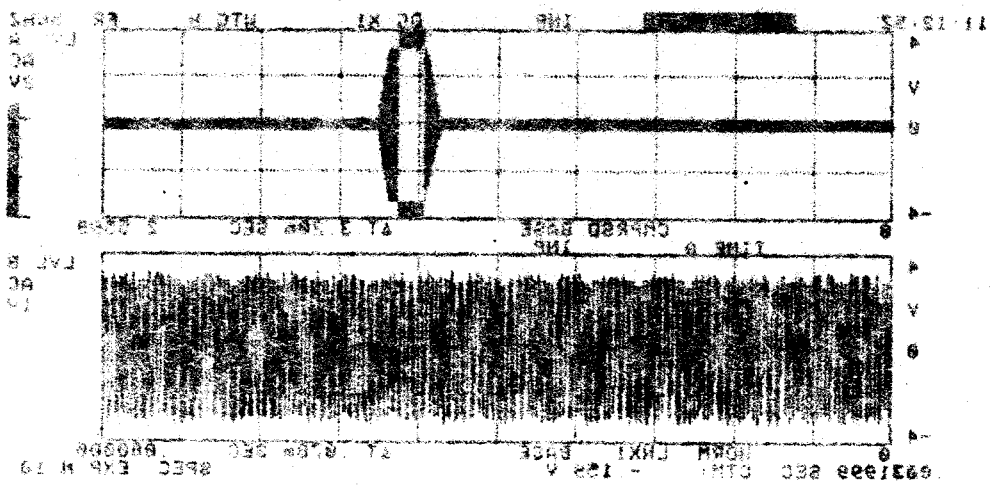

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Figure 3-DSP\SEL-16. TIME FUNCTION Menu Selection 3, CURIME & TIME

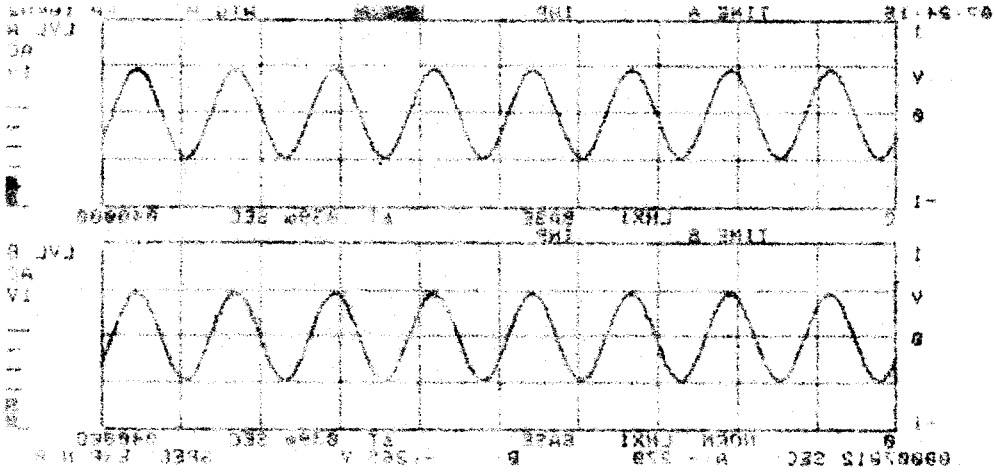


FIGURE 3-DSP\SEL-17. TIME FUNCTION Menu Selection 4, 2 CH TIME

Function Group - STATISTICS

Refer to the first two items on the STATISTICS FUNCTION menu, PDH and CD. These are both single channel functions displaying the same data from two different sources; i.e., Real Time Amplitude Domain data from the Input Memory and Averaged Amplitude Domain data from the Average Memory. For these selections, the DISPLAY MEM menu determines which data ends up in which trace; e.g., RT & AVG, RT is always the upper trace data and STO is always the lower trace data; AVG & STO, AVG is always the upper trace data and STO is always the lower trace data.

For selections 3 and 4, 2 CH PDH and 2 CH CD, the selected two-channel combination determines which data ends up in which trace. Channel A is always the upper trace and Channel B is always the lower trace.

With the exception of the first two function selections (PDH and CD), the contents of only one type of memory at a time can be displayed. For example, if you select 2 CH PDH, a dual trace display, and STO from the DISPLAY MEM menu, both traces will be the contents of the two available Storage Memories (each channel has its own Input Average and Storage Memory). No combination memory displays for 2 channel functions.

There are, basically, two statistical distributions calculated for this Function Group (PDH and CD). STATISTICS FUNCTION menu items 3 and 4 are the two channel acquisition modes for the two statistical distributions.

The Probability Density Histogram (PDH) is a measure of how a signal is distributed, in amplitude, over a selected measurement interval. PDH is displayed over a symmetrical range of amplitudes from a positive to negative full scale value with a zero center value. It is a relative frequency distribution (frequency, in this case, meaning "how often"). This distribution is based on a percentage of the summation of the total number of occurrences, calibrated from zero percent (low abscissa value) to 100 percent (high abscissa value).

Whenever a PDH function is selected, four statistical "moments" are calculated and the results appear at the top of the display as shown in Figures 3-DSP/SEL-19, 22, 25 and 28.

A brief interpretation of the four statistical moments is as follows:

MEAN: This calculation is the average DC level of the Time Domain signal. the result is in units of plus (+) and minus (-) Volts.

SIGMA This calculation is the ac rms value of the signal; a measure of its power. The result is in units of plus (+) Volts. In addition, it is also a measure of the average deviation of the input samples from the mean (standard deviation).

SKEW: Skewness is a measure of the symmetry of the distribution about the mean. A tail on the positive side and a bulge on the negative side of the PDH distribution indicates a positive Skew. The result is in units of ratio (unitless).

KURTOSIS: Kurtosis is related to the shape of the PDH distribution and is sometimes called flatness. As with Skewness, the tails are emphasized and the result is unitless. Some typical diagnostic Kurtosis values are:

1.0 for a square wave

1.5 for a sine wave

1.75 for a triangle wave

3.0 (nominal) for normal Gaussian noise; lower for periodic noise and higher for "spikey" signals.

Figures 3-DSP/SEL-18 through 3-DSP/SEL-29 are examples of PDH and CD calculations for a square wave, a sine wave, a triangle wave and random noise. Each example is accompanied by the related Time Domain signal. Note the differences in the shape of the PDH distribution and CD curve for each Time Domain signal.

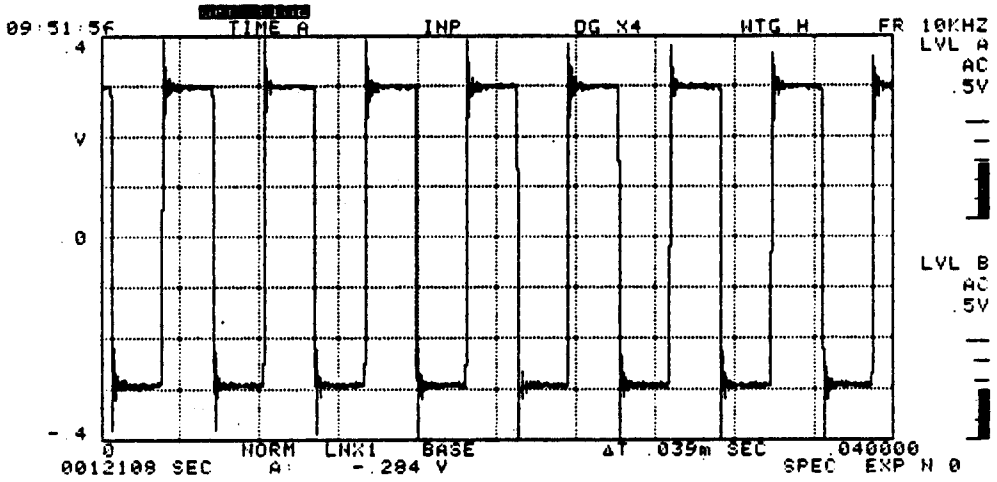


Figure 3-DSP/SEL-18. Square Wave Example

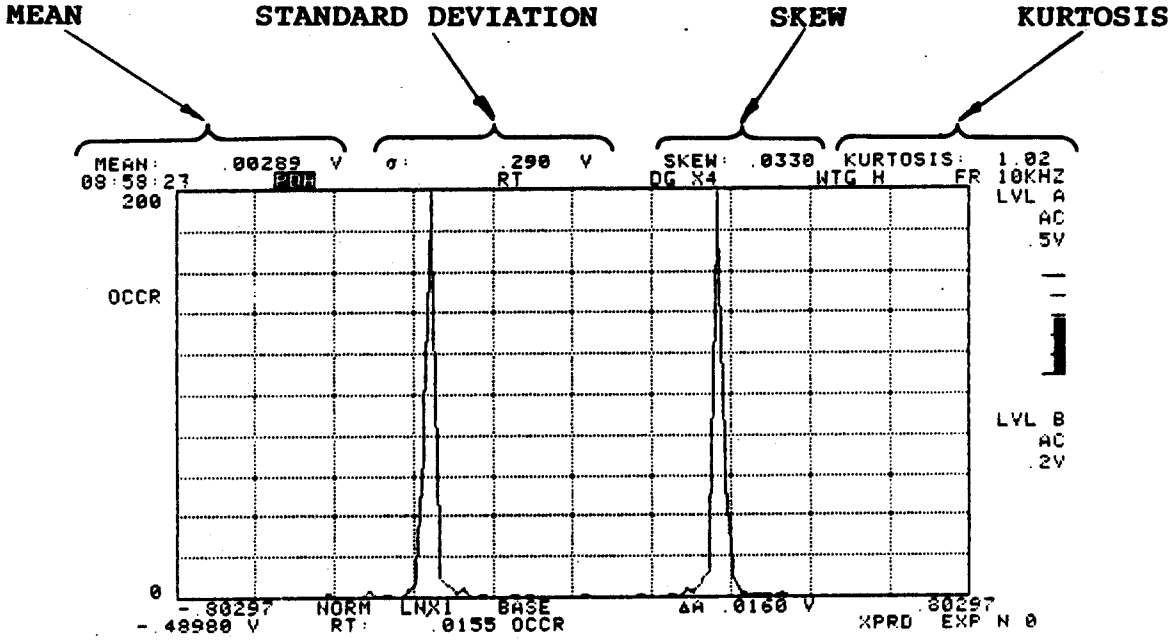


Figure 3-DSP/SEL-19. PDH Distribution of the Square Wave Shown Figure 3-DSP/SEL-18.

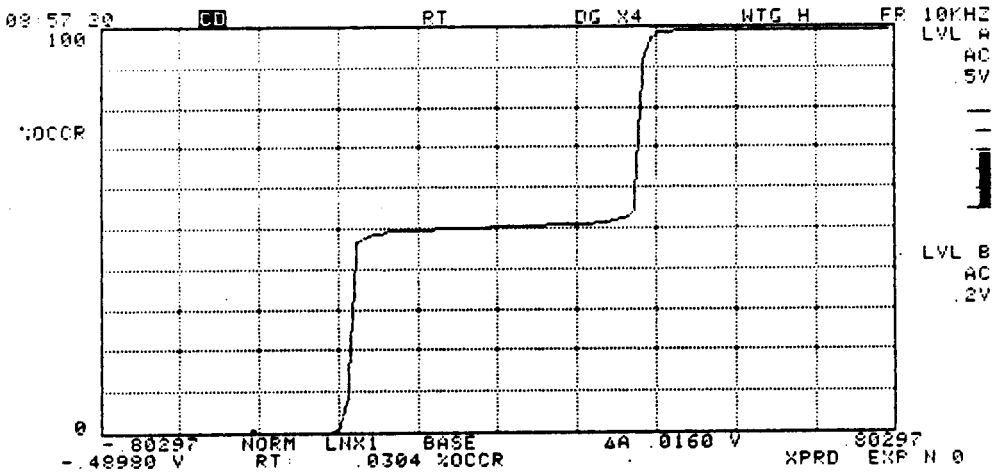


Figure 3-DSP/SEL-20. CD Curve of Square Wave Shown in Figure 3-DSP/SEL-18.

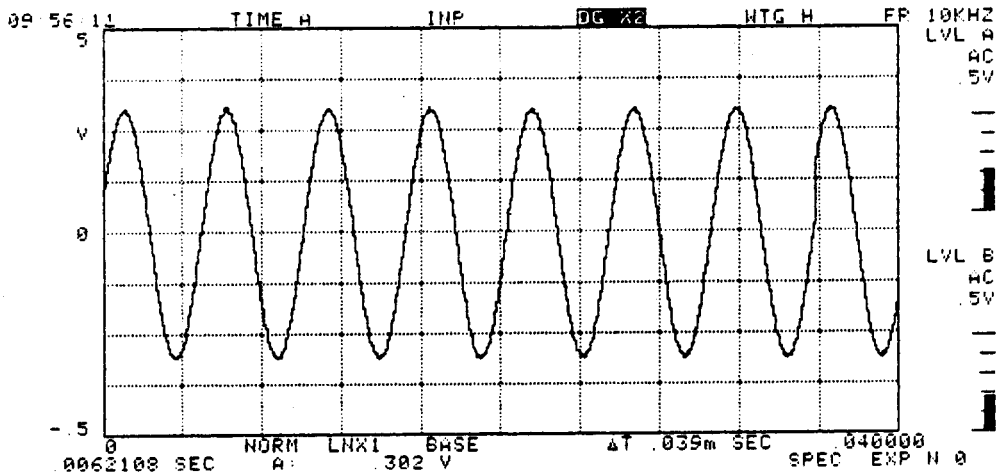


Figure 3-DSP/SEL-21. Sine Wave Example

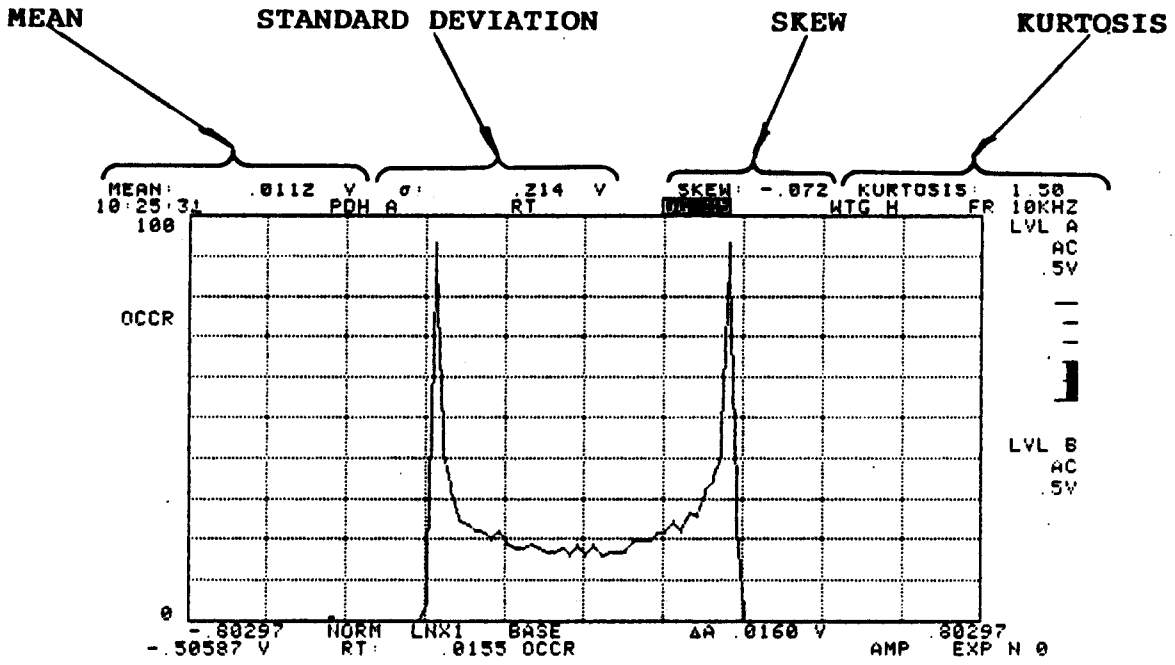


Figure 3-DSP/SEL-22. PDH Distribution of the Sine Wave Shown in Figure 3-DSP/SEL-21.

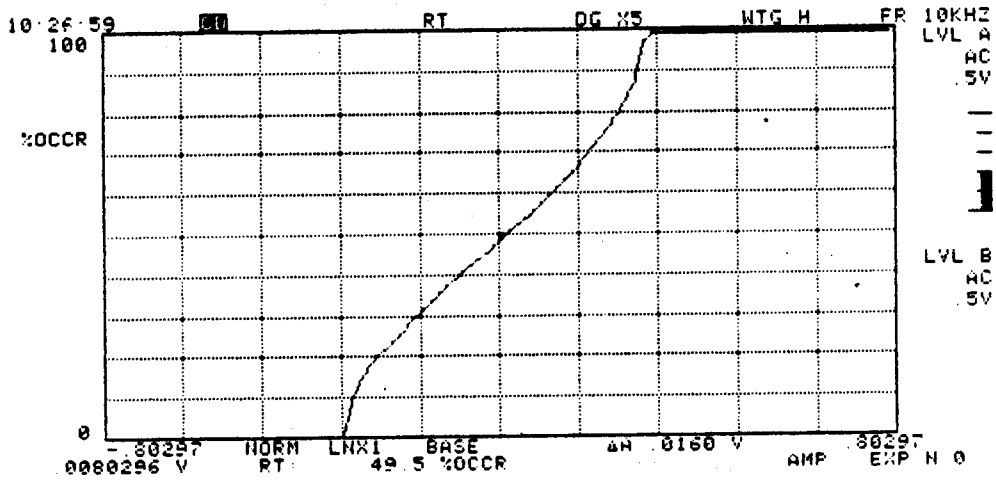


Figure 3-DSP/SEL-23. CD Curve of Sine Wave Shown in Figure 3-DSP/SEL-21.

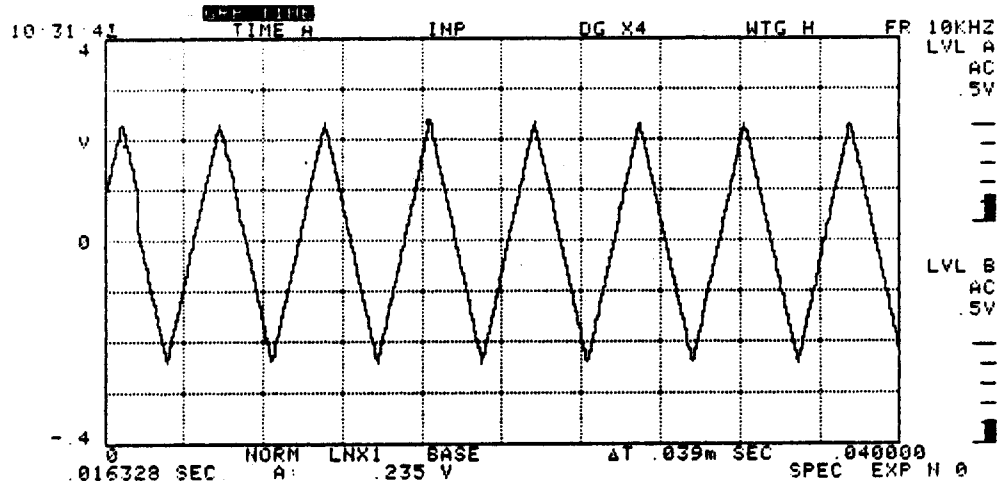


Figure 3-DSP/SEL-24. Triangle Wave Example

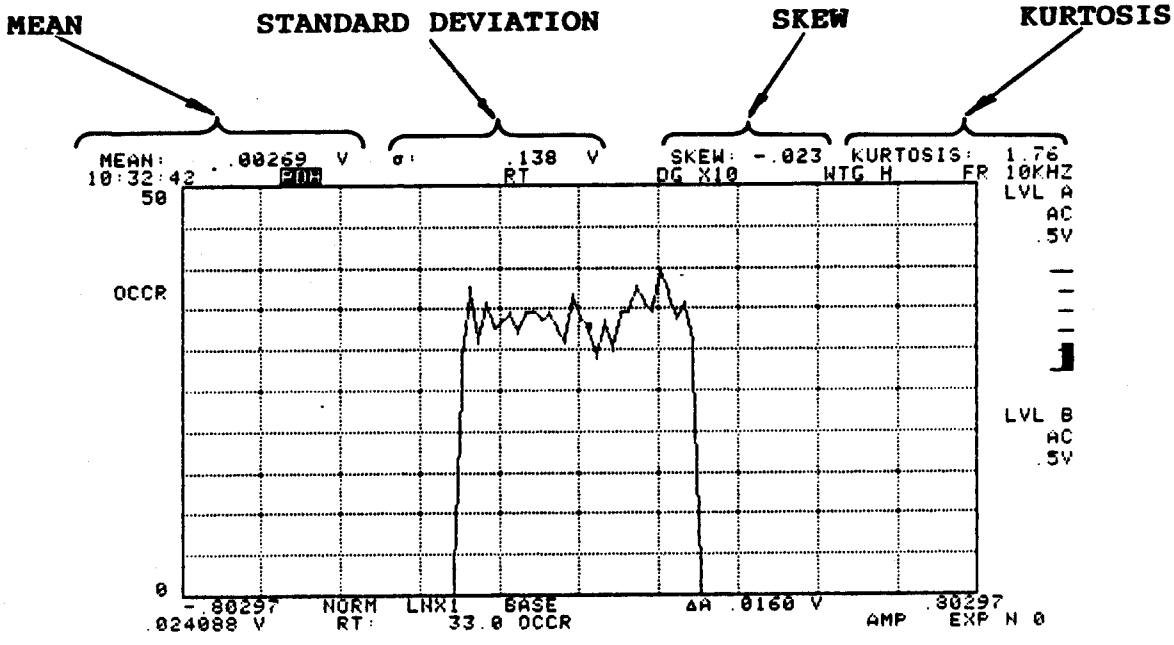


Figure 3-DSP/SEL-25. PDH Distribution of Triangle Wave Shown in Figure 3-DSP/SEL-24.

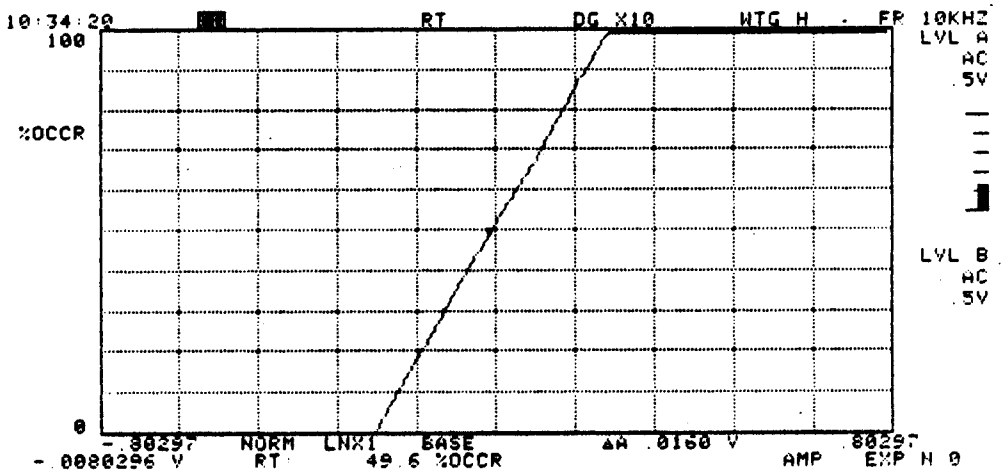


Figure 3-DSP/SEL-26. CD Curve of Triangle Wave Shown in Figure 3-DSP/SEL-24.

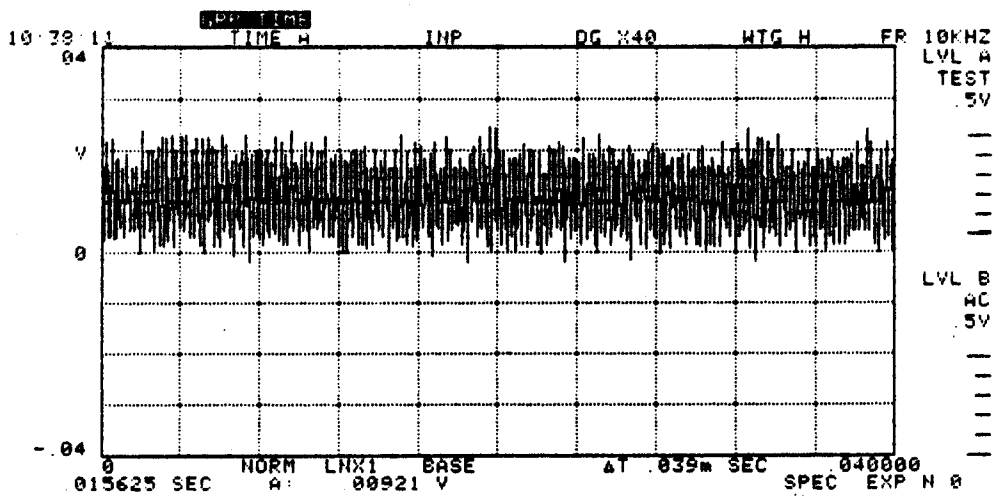


Figure 3-DSP/SEL-27. Random Noise Example

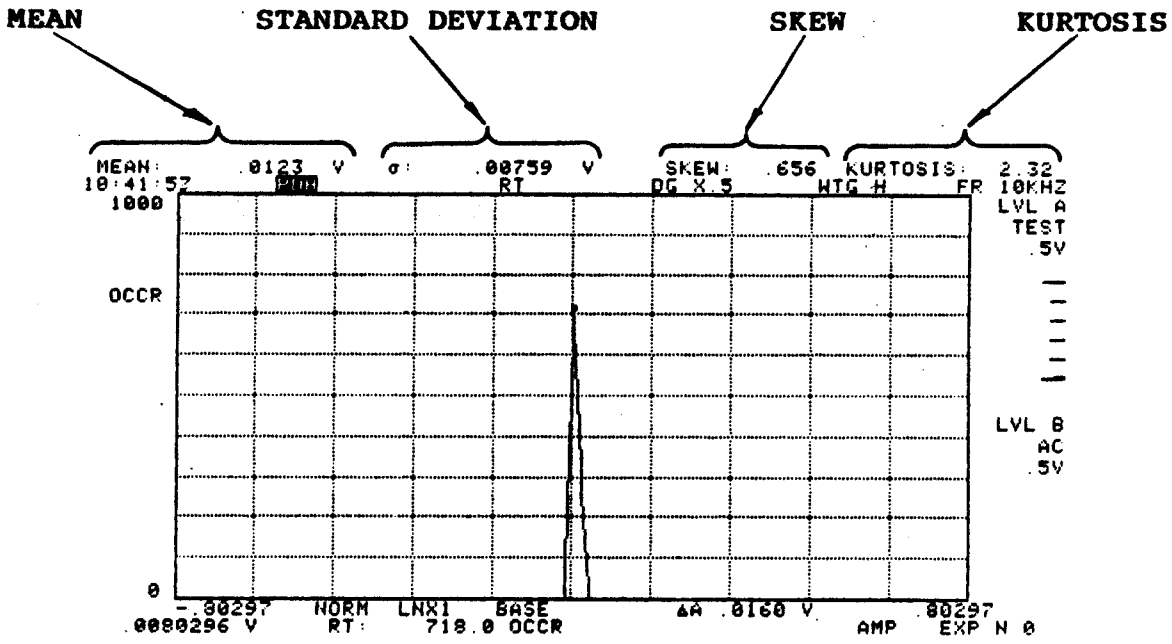


Figure 3-DSP/SEL-28. PDH Distribution of Random Noise Shown in Figure 3-DSP/SEL-27.

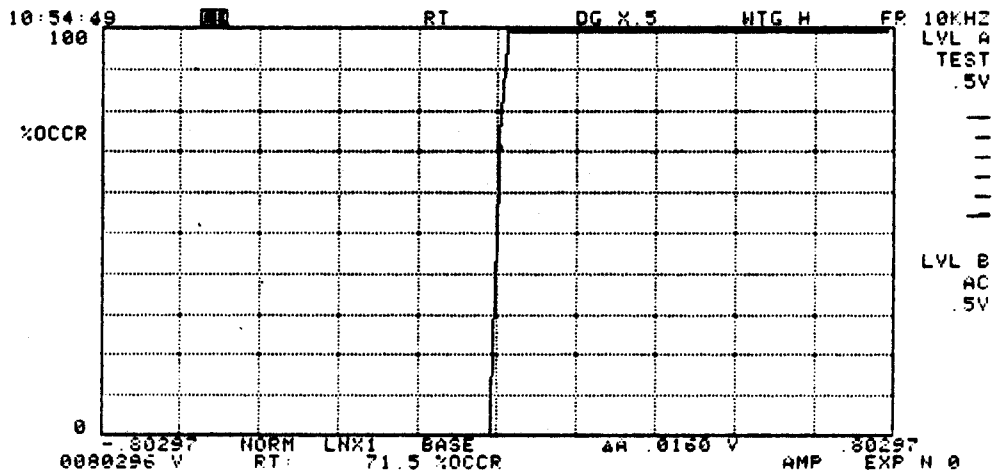


Figure 3-DSP/SEL-29. CD Curve of Random Noise Shown in Figure 3-DSP/SEL-27.

The Statistics Functions have "dedicated" or "fixed" X and Y-axis data distribution where X-axis expansion for both PDH and CD will always be LNX1 (linear, times one). No LNX2, LNX4 or LOG. Y-axis data distribution will always be linear (LIN).

Figures 3-DSP/SEL-30 through 3-DSP/SEL-33 are basic examples of each STATISTICS FUNCTION menu item.

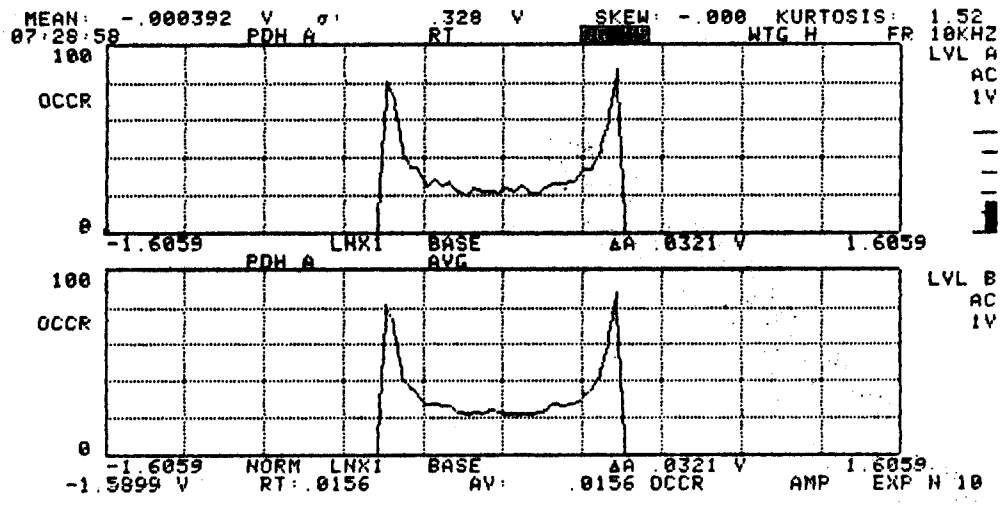


Figure 3-DSP/SEL-30. STATISTICS FUNCTION Selection 1, PDH

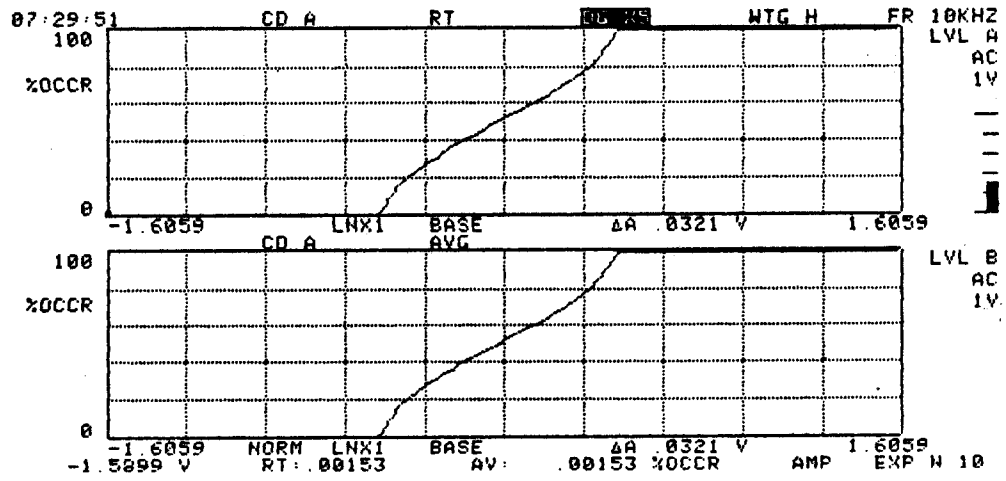


Figure 3-DSP/SEL-31. STATISTICS FUNCTION Selection 2, CD

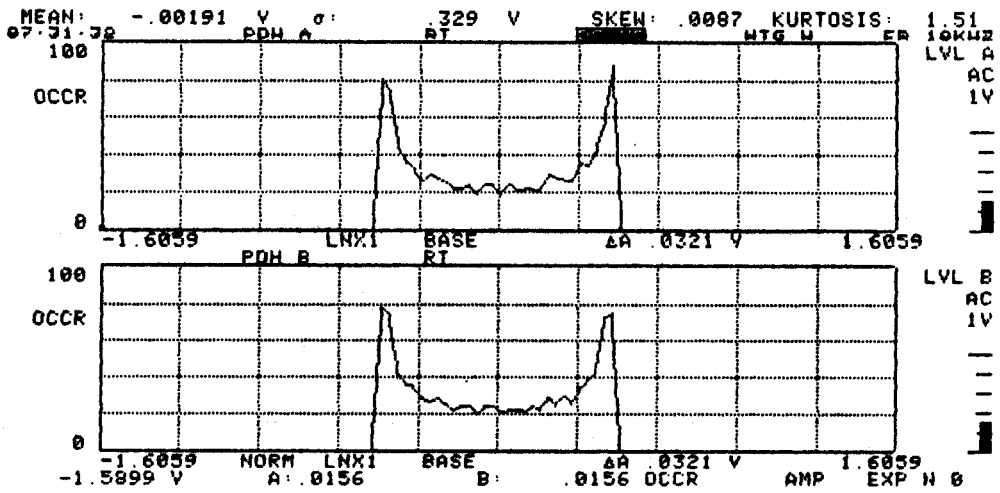


Figure 3-DSP/SEL-32. STATISTICS FUNCTION Selection 3, 2 CH PDH

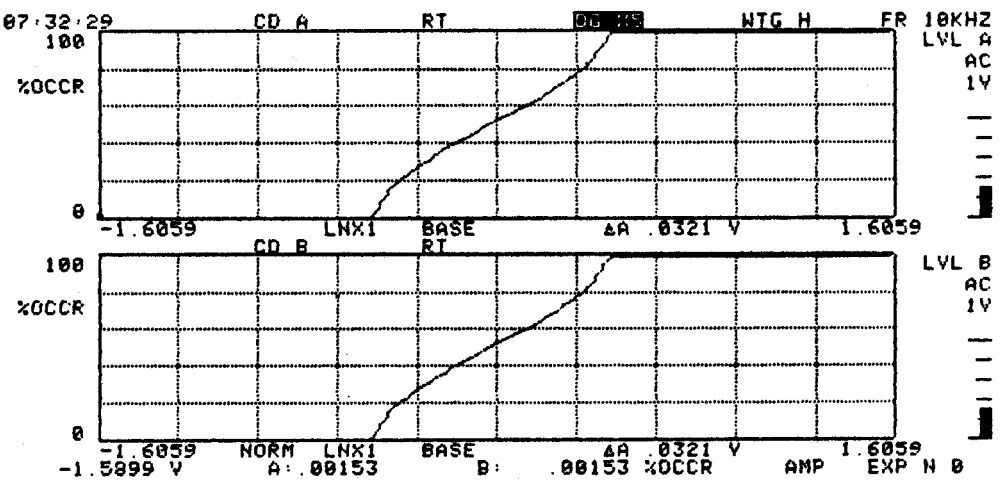


Figure 3-DSP/SEL-33. STATISTICS FUNCTION Selection 4, 2 CH CD

Function Group -- TRANSFER FUNCTION

This Function Group is a "cross channel" Function Group and is available only with the two channel option. The term "cross channel" refers to those functions using a quantity called "Cross Spectrum". Cross Spectrum is the complex product of the complex spectrum (real and imaginary) of Channel A and the complex spectrum of the response channel (Channel B).

Transfer Function is basically the effect that a "specimen" has on an applied stimulus. For example: The specimen is a "black box," with an input and an output (Figure 3-DSP/SEL-34). The primary purpose is to determine what the specimen does to an input signal in order to get an output signal. The input signal may be an "impact," the output signal the resultant vibration. the characteristics of the specimen which produced the output signal is the specimen's Transfer Function.

The Transfer Function calculation is defined as the ratio of the Cross Spectrum to the input Power Spectrum; e.g., the analyzer calculates the Cross Spectrum using the Averaged Power Spectrum data from both Channels A (Input) and B (Response). The Transfer Function is then calculated by dividing the resultant Cross Spectrum data by the Averaged Power Spectrum from Channel A (the same Channel A used in the Cross Spectrum Calculation). Keep in mind that the preceding definition is a simplified version of the Transfer function calculation.

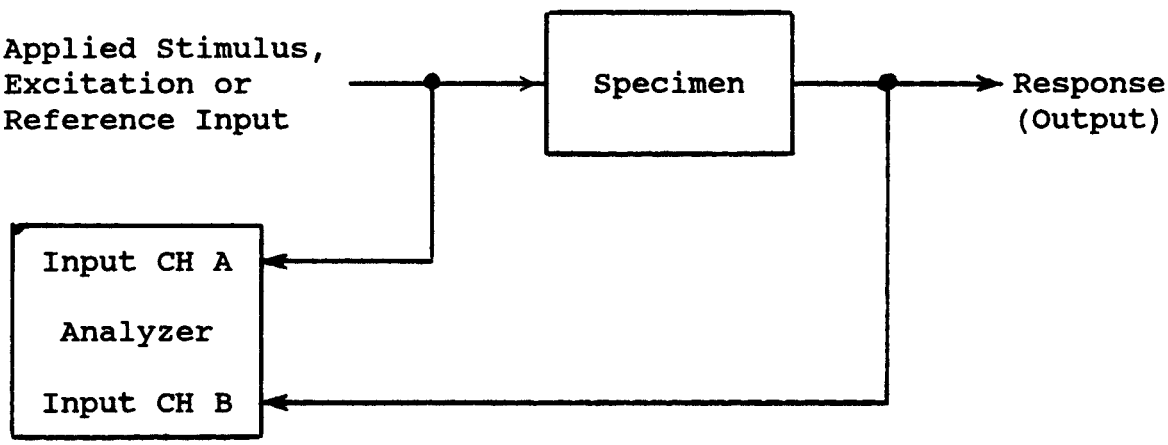


Figure 3-DSP/SEL-34. Basic Transfer Function Interconnect

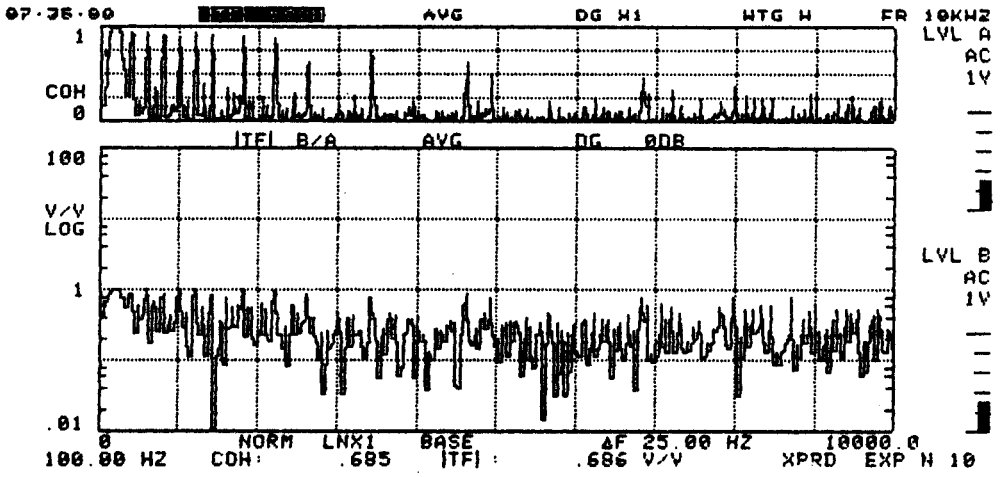


Figure 3-DSP/SEL-37. TRANSFER FUNCTION Selection 2, |TF| & COH

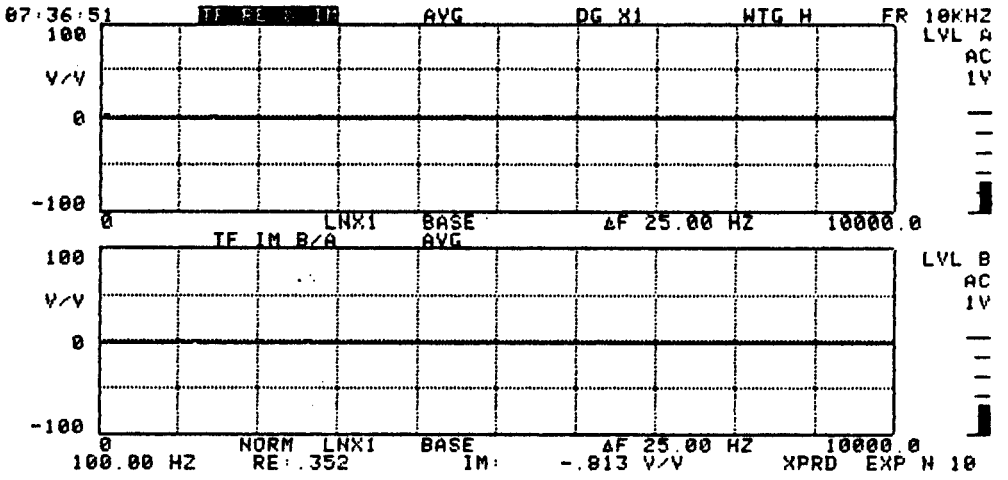
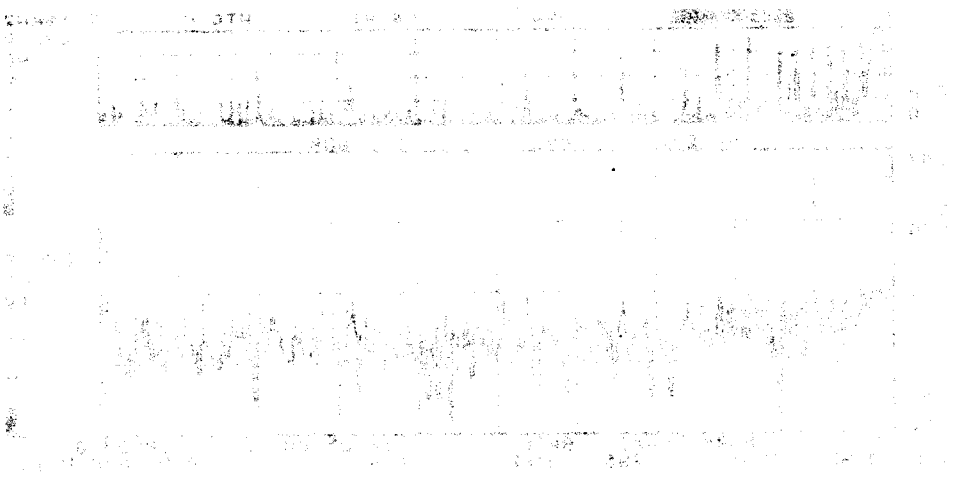


Figure 3-DSP/SEL-38. TRANSFER FUNCTION Menu Selection 3, TF RE & IM



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