Operator's Manual
SD385 NOMAD Portable Signal Analyzer
Part One

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

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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

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GENERAL INFORMATION

1-1 INTRODUCTION

This manual contains unpacking, initial checkout and operating instructions for the Spectral Dynamics Model SD385 "NOMAD" portable Signal Analyzer. The manual is divided into three sections. Each section covers a specific aspect of the instrument. This section contains a general description of the instrument, a list of other documentation, if any, an introductory TOUR and instrument specifications.

1-1.1 Equipment Description

The SD385 is a microprocessor based 1 or 2 channel signal analyzer. It measures the signal(s) present at one or two BNC connectors located on the front panel and, in the case of the two channel option, the relationship between two signals. If you have the single channel option, only the A BNC connector (J1) is available. If you have the two channel option, BNC connectors A (J1) and B (J2) are available.

Measurement results can be displayed on an optional built-in EL display or a customer-furnished externally connected monochrome or color monitor. Connections for both type monitors are provided.

There are two main parts to measurement display; a scaled trace and a cursor readout. The trace is an X-Y array of measured values, graphically represented with data points or lines, scaled to units and distributions by the operator from various control fields. The cursor readout is, typically, a three-place accuracy numerical reading on a trace data point that the operator indicates using the front-panel cursor controls.

The operator can adjust the range of the displayed trace controls for linear and logarithmic traces on both the X and Y-axis and apply a certain amount of output gain on the trace. Times two (X2) and time four (X4) expansions on the X-axis are available. In addition, X-axis ZOOM is available, providing increased baseband resolution from 2 to 128 times the normal baseband resolution.

In order to store, retain and smooth data, the instrument is provided with an Averager Memory and a Storage Memory where Frequency, Time and Amplitude domain data can be averaged and then stored. If your instrument has the two channel option, each channel has its own Average and Storage Memory.

In addition to the standard signal analysis capabilities, the instrument is equipped with a built-in Waterfall feature, 1/3 and 1/1 Octave Analysis capability, a 32k sample (per channel) Input Memory, an IEEE interface and the ability to perform single/double integration/differentiation. These features are also standard in the SD385.

1-1.2 SD385 Options

EL Display (-1 Option)

Built-in Electroluminescent Display provided in the unit lid (not field installable).

Two Channel (-2 Option)

This option expands the instrument's capabilities to include the cross-channel functions; i.e., Transfer Function, Power and IFFT (Inverse Fast-Fourier Transform). Also, the Spectrum, Time and Statistical functions are now capable of two-channel acquisition.

Signature Ratio^{R}/Tach (-3 Option)

This option provides speed compensation for easy interpretation of machine signatures and eliminates the need for any external tracking adapter and tracking filter to remove aliasing errors from the measurement. The ability to accommodate a wide variety of tach signals and the standard Waterfall display makes it ideal for rpm tracking analysis of machine run-up and coast-down measurements.

Data Storage (-4 Option)

This option provides permanent storage of digital data or processed results for archival purposes or subsequent review. The storage media is a removable 3.5 inch micro floppy disk with 720 kbyte capacity.

Setup data, Time domain data, Frequency domain data or Waterfall files can be stored or recalled. Full high-resolution data is stored for recall and used for other post-processing operations such as math manipulation or modal analysis.

1-2 GUIDE TO THE MANUAL

The purpose of this manual is to provide the operator with the information needed to properly configure and operate the SD385.

This section (Section I) contains a brief description of the instrument, information concerning other documentation, this guide, a "TOUR" and equipment specifications. Section II covers unpacking instructions, packing for reshipment instructions and safety precautions. Section III covers each function of the instrument and is organized by Setup Pages, followed by a description of the front and side panels which are organized by Button Groups. Appendix A covers operation of the IEEE interface. Appendix B contains the option manuals.

The "TOUR" that follows this guide takes you through the instrument controls sequentially to demonstrate the major features of the instrument and how to operate them. After you complete the Tour, Section III begins with an Operational Overview that briefly explains what you just did.

The buttons on the front panel of the SD385 are dedicated to two things; manipulating the configuration controls and initiating an operation. The functions performed by the instrument are contained on the Setup Pages and Control Menus. For this reason, the description of the Setup Pages and Control Menus in Section III precedes the front-panel button description. All the Setup Page descriptions are tabbed by Setup-Page title and numbered by Setup Page. In addition, each front-panel button group description is tabbed by button-group title.

There are nine Setup Pages, each dedicated to a specific group of functions or modes, indicated by the Setup Page title. These are:

Setup Page 1 - ACQUISITION PAGE

This Setup Page covers the basic controls for data acquisition; e.g., triggered Input Memory acquisition, signal data sampling, signal coupling, average count, average time, memory period overlap, etc.

Setup Page 2 - INPUT/PROCESS CONTROL

This Setup Page covers frequency range selection, input level selection, analysis band selection, FFT weighting, the average mode, the type of data to be averaged, etc.

Setup Page 3 - DISPLAY SELECTION PAGE

This Setup Page covers the primary functions performed by the SD385 (Spectrum, Time, Statistics and, for the two channel instruments, Transfer Function Power and IFFT). In addition, display memory and Spectrum math selections are also covered on this Setup Page.

Setup Page 4 - X & Y UNITS PAGE

This Setup Page covers X and Y-axis units and distributions, display gain, X-axis expansion and the Cursor Mode.

Setup Page 5 - Y CALIB PARAMETERS

This Setup Page covers parameters for user-defined Y units such as EU (Engineering Units), dBR (dB Reference), VREF (Voltage Reference), Phase Offset and the Artificial Integration feature.

Setup Page 6 - WATERFALL CONTROL PAGE

This Setup Page covers the acquisition controls and the numerical entry control fields for the Waterfall feature; e.g., Waterfall Update Mode, Waterfall Display Mode, etc.

Setup Page 7 - IEEE COMMUNICATION

Operation of the IEEE feature is covered in Appendix A. However, when the IEEE bus is being used, this Setup Page allows the user to assign a device address, designate the data format and to assign input/output terminators.

Setup Page 8 - DIGITAL PLOTTER PAGE

A digital plot is initiated by pressing the front-panel PLOT button. This Setup Page allows the user to designate what is going to be plotted and how the plot is to be accomplished.

Setup Page 9 - OPTIONS-SRA/TACH & DISK

This Setup Page contains the control menus for the SRA (Signature Ratio Adapter) Option (the SRA Option is enabled via the SAMPLING SOURCE menu located on Setup Page 1) and the control menus for the Data Storage Option.

1-3 SD385 TOUR

The objective of this tour is to familiarize you with the features of the SD385 and its associated controls. This TOUR is designed to require only the SD385, an audio signal oscillator and, if your instrument is not equipped with the optional built-in EL display, an external monitor that requires either an RGB or a composite video input. Connections for both types of monitors are located on the right side of the instrument towards the back.

Each section is organized to allow the single channel user to skip the two channel information.

Before continuing, connect a BNC TEE to the output of the oscillator. Connect two BNC cables from the TEE to the Channel A (J1) and Channel B (J2) BNC connectors located on the front-panel of the SD385. If you have a single-channel instrument, the BNC TEE is not required. Simply connect a BNC cable between the output of the oscillator and the Channel A (J1) BNC connector on the front-panel of the SD385. Do not energize either instrument. Adjust the oscillator for minimum output and a frequency of approximately 5kHz.

1-3.1 Basic SD385 Control Concepts

Energize the SD385 and the oscillator. The SD385 will emit an audio signal (a "beep") and, after a moment or two, a message similar to the example shown in Figure 1-1 will appear. The number of channels, revision letter, and options installed may differ. Note the message at the bottom of the display: PRESS SEL TRACE OR HELP TO CONTINUE.

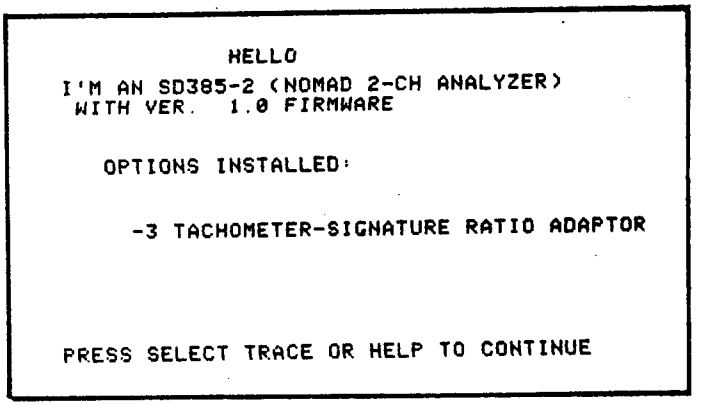

Figure 1-1. Introductory Statement

The HELP button is located in the center of the SETUP group. The SEL TRACE button is located in the lower left-hand corner of the SCROLL group. Press the SEL TRACE button and look at the display. Depending on the configuration the analyzer was in when last turned off, there should be one or two sets of grids. Data may or may not be displayed.

Located in the SETUP group is a button labeled PANEL. Just to the left of the SETUP group is the ENTRY keypad. Locate the button in the top row of the ENTRY group labeled RCL and the 0 in the bottom row. Press, in sequence, PANEL, 0, RCL. This automatically places the analyzer in a factory determined configuration. This button-pushing sequence will be used as a reference throughout this tour and will be referred to as "Panel-Zero-Recall."

Adjust the output of the oscillator for 1 Vrms. The display should be similar to the one shown in Figure 1-2.

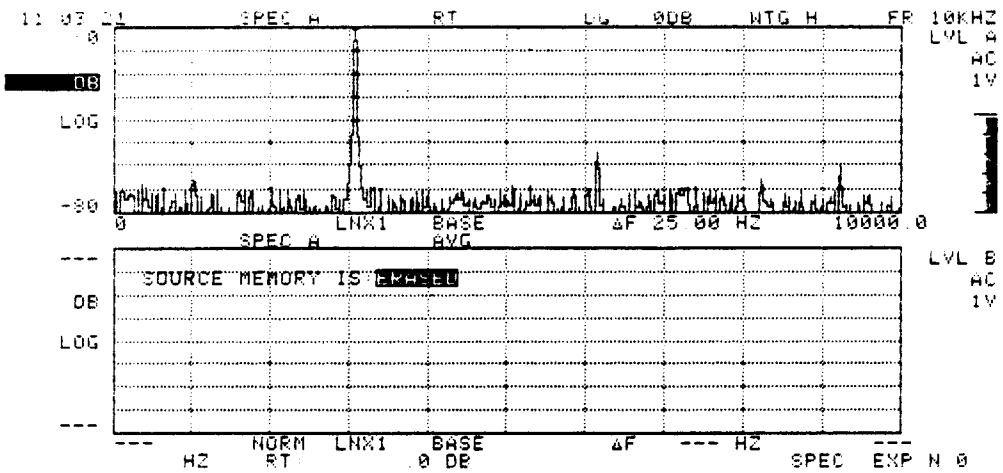

Figure 1-2. The PANEL-0-RECALL Display

The annotation surrounding the display provides information about the displayed data and the various control menu selections. These control menus are used to select the functions performed by the SD385 (i.e., Spectrum, Time,

Statistics, Transfer Function, etc.) and to select/control the various display configurations (i.e., Frequency Range, Input Level, X and Y axis data distribution, Cursor Mode, Resolution, etc.). There is, above each grid, important information that defines just what you are viewing on the display. This information consists of the selected function including the channel being displayed (e.g., SPEC A indicates Spectrum Data, Channel A), and the source memory of the data being displayed (e.g., RT for "Real Time" indicating FFT'd data from the Input Memory, INP indicating Time Domain data in the Input Memory, AVG indicating averaged data from the Average Memory and STO indicating averaged data that has been placed in the Storage Memory). Note the message displayed in the lower grid, SOURCE MEMORY IS: ERASED. Since the instrument has just been turned on, the memory selected for the lower trace (AVG for Average Memory) is empty, or erased. Also note that the lower trace has dashes in various positions around the display in place of the scaling and calibration information. Again, this is due to there being no data in the Average Memory.

The annotation along the left hand edge of the display provides Y-axis information. This information consists of the Y-units being displayed (linear or logarithmic), the full scale Y-amplitude, and the Y-amplitude at the bottom of the grid.

At the bottom of the display is annotation providing information about the X-axis. Specifically, the X-units being displayed, the value of the left and right side of the grid in those units, and the value, in X-units, of each X-axis step (the ^f, or resolution).

The very bottom line of display annotation contains the data cursor information and is referred to as the cursor readout line. Located at the left edge of the trace (unless you've moved it already) is a bright square dot, this is the data cursor. The numbers in the cursor readout line are the X and Y-axis values of the cursor position. The position of the cursor is controlled by the CURSOR group buttons. Using these buttons, position the cursor on the signal displayed on the upper trace. Note the vertical line that appears when the cursor is moved. This makes it easier to locate the cursor as it moves. The cursor information line should now indicate the frequency and amplitude of the oscillator signal.

There are four buttons in the CURSOR group marked with arrows. The buttons with the arrows pointing UP and DOWN are for moving the cursor from one trace to the other. Pressing the LEFT or RIGHT button will move the cursor one ^f increment to the right or left. Continual pressure on the button will enable the silent sweep. The instrument will single step the cursor one time before the silent sweep commences. Also note the button located between the left and right arrows labeled FAST. When this button is pressed, simultaneously, with either the LEFT or RIGHT button, the data cursor will move ten times faster than if you didn't do this.

The AVERAGE group START button, when pressed, erases any data already held in the Average Memory and initializes a new average. If the AVERAGE group STOP button is pressed while an average is progress, the averaging process will, just as you suspected, stop and the Average Memory will be in a temporary "hold" status. As long as no control changes are made while the average process is stopped, the average can be resumed by pressing the AVERAGE group CONT button. Press the START button and observe the lower trace. The SOURCE MEMORY IS: ERASED message will disappear and trace calibration data will be displayed as shown in Figure 1-3. Push the CURSOR group DOWN button to position the cursor in the lower trace.

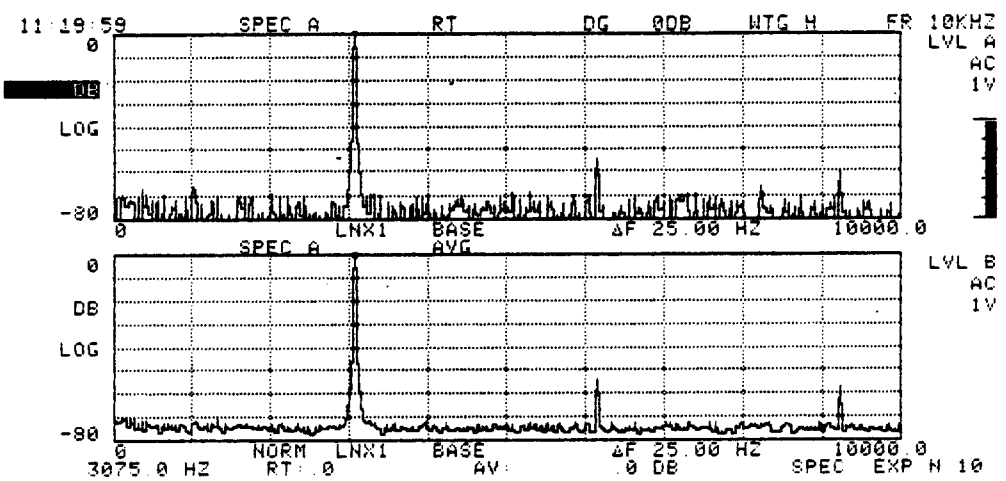

Figure 1-3. Average Memory Display

Observe the upper trace and notice the signal activity at the baseline. This is low level shifting of the signal and inherent noise. Adjust the output frequency and level of the oscillator while observing the upper trace.

The group of buttons located above the AVERAGE group is the INPUT MEMORY group. Two of these buttons are labeled UPDATE and HOLD. These buttons allow data to be loaded into memory, or retention of current data, respectively. Push HOLD and, while watching the upper trace, adjust the frequency and level of the oscillator. Data in the Input Memory is no longer being updated. The displayed data is retained until the UPDATE button is pressed. Press the UPDATE button and notice the upper trace shows movement of the signal.

Note the highlighted word "SPECTRUM" at the top of the display. This is a Reverse Video Control Field and will be referred to, throughout this tour, as the "RV." The setting highlighted by the RV can be changed by pressing the SCROLL group UP or DOWN buttons. Throughout the remainder of this tour, this process of changing a setting via the SCROLL buttons will be referred to as "selecting."

The SETUP directional buttons are used to position the RV on the various control fields surrounding the display. Press the SETUP group RIGHT button twice to position the RV on DG 0DB. This is the DISPLAY GAIN field. Press the SCROLL DOWN button to select -10 dB as the top reference of the display. Observe the effect this has on the trace. Figure 1-4 shows all of the display control fields. Use the SETUP group directional buttons to position the RV on these various controls.

The row of 6 buttons located in the upper right-hand area of the front panel is the FIELD LOCATOR group. These buttons, when pressed, position the RV directly on the control field identified by the button label. These buttons are provided as a convenience feature to allow you to access frequently-used control fields without excessive manipulation of the SETUP group directional buttons. In addition, the control fields that these buttons access have been strategically located to allow you to "ballpark" the RV close to other control fields you may want to access. Press each of the 6 FIELD LOCATOR buttons and observe where the RV is placed. Figure 1-5 shows which display control fields are accessed by the FIELD LOCATOR buttons. Press the AVG FIELD LOCATOR button.

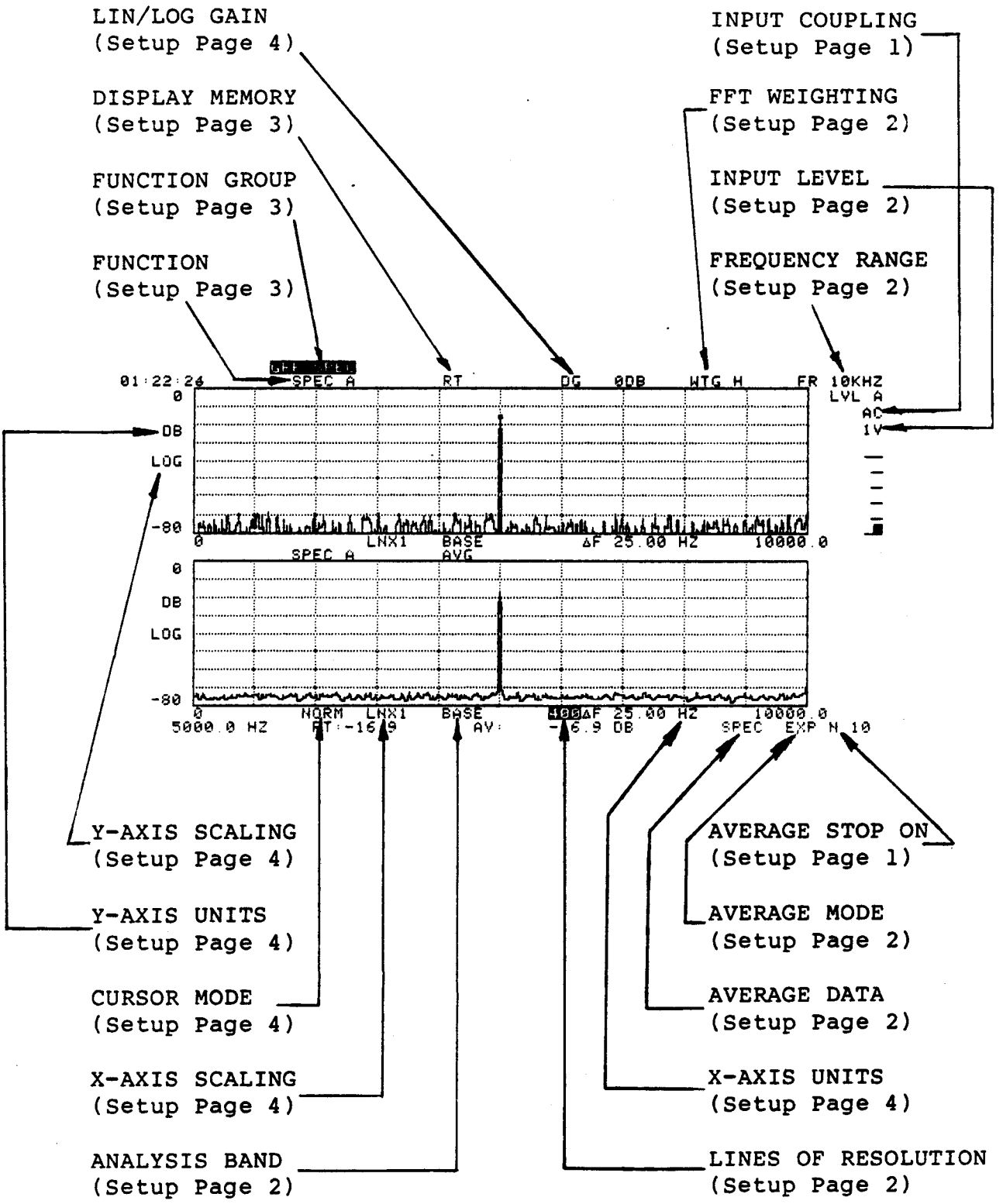

Figure 1-4. Display Controls Accessed by the RV

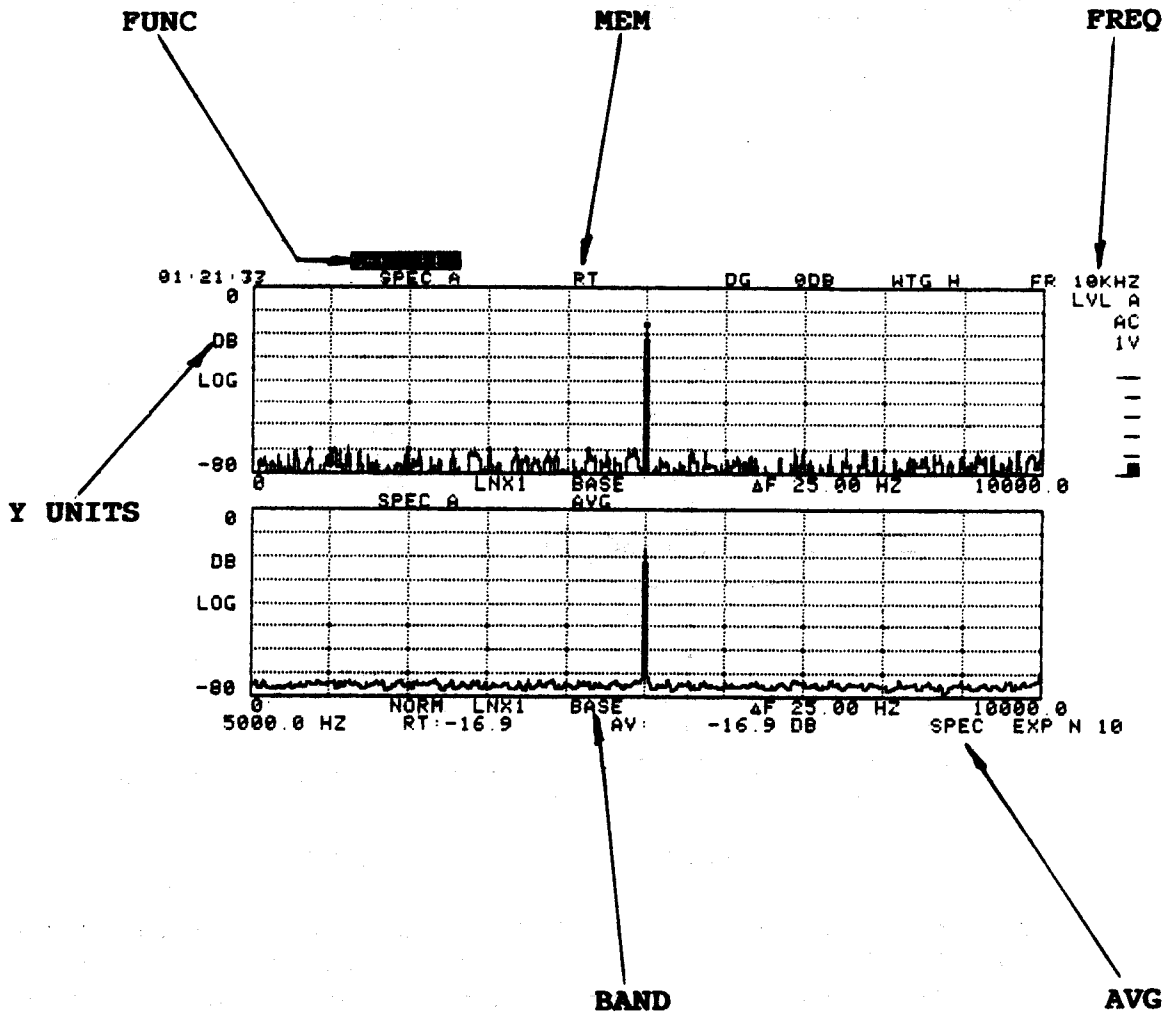

Figure 1-5. Display Control Fields Accessed by the FIELD LOCATOR BUTTONS

The SD385 is provided with two features to help you become more familiar with the instrument. These two features are the MENU (SCROLL group) and HELP (SETUP group) buttons. Press the MENU button and notice the grid lines on the right side of the display are replaced by a menu. An example is shown in Figure 1-6. This menu lists the selections available for the display control field on which the RV is placed. The current selection on the menu is highlighted with its own RV and is controlled with the SCROLL group UP/DOWN buttons.

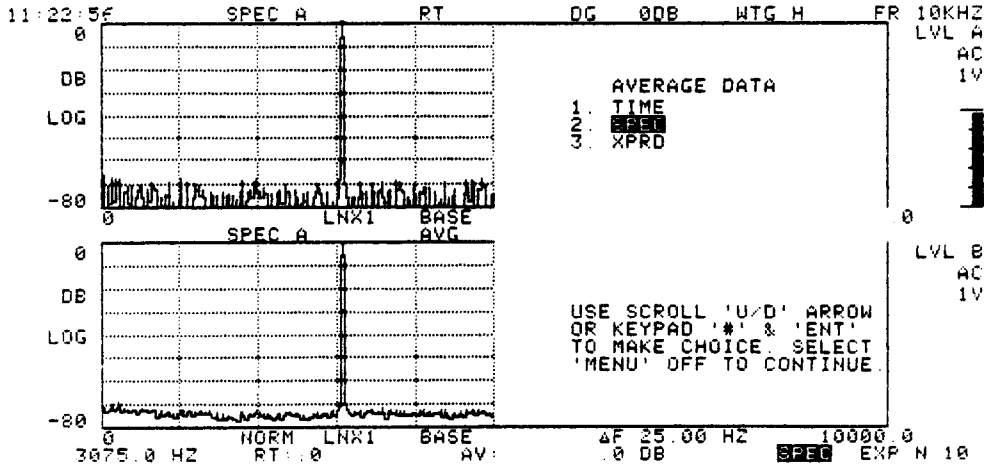

Figure 1-6. Menu Display

Using the SETUP group directional buttons and FIELD LOCATORS, place the RV on the various control fields and observe the available menus and control fields. Note that by using this method of control manipulation, the instrument can be set up for many types of signal data acquisition/process/display operations. Press the MENU button to exit the menu mode.

Press the HELP button and note the displayed message as shown in Figure 1-7. This feature provides general information on the various control fields surrounding the display and the front-panel buttons. Once again, place the RV on the various control fields and observe the HELP messages available for the control fields.

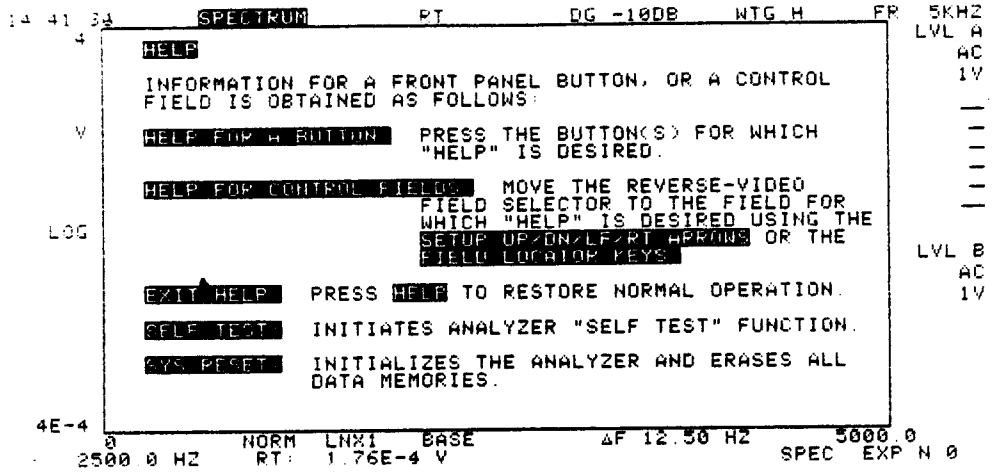

Figure 1-7. The Introductory HELP Message

Note that the HELP messages for the SELF TEST and SYS RESET buttons are included with the introductory HELP message. The reason for this is that any time either of these buttons is pressed, the instrument will do exactly what the button says, regardless of the instrument mode.

Press the rest of the front-panel buttons (being careful not to press either the SELF TEST or the SYS RESET button) and review the HELP messages available for the buttons or button groups.

When review of the HELP feature is finished, press the HELP button again. This turns off HELP and places the instrument back in the normal display mode. Perform a Panel-Zero-Recall.

The same menus and control fields that are accessed from the display are also located on "Setup Pages." Easy access to the Setup Pages is provided via the SETUP ON/OFF button. This button is located in the upper left-hand corner of the SETUP group. Press this button and the PANEL RECALL CONTROL & SETUP PAGE SELECT listing (hereafter referred to as the Setup Page listing) will appear. Figure 1-8 is an example of the Setup Page Listing.

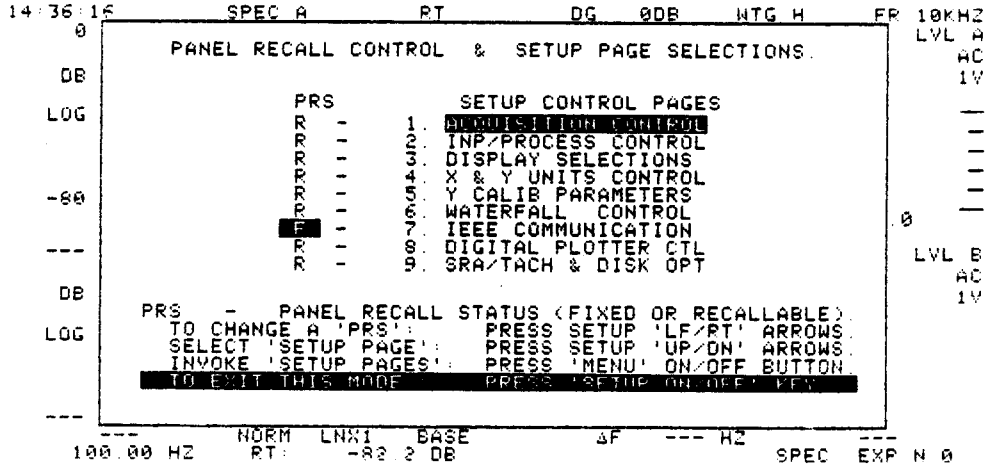

FIGURE 1-8. The SETUP PAGE listing

The position of the RV, on the Setup Page Listing, is controlled any one of three ways: The SETUP group UP/DOWN buttons, the SETUP group PAGE ADV button or by the entry of the page number via the ENTRY keypad.

Press and hold the SETUP DOWN button. The RV will "wrap-around" the listed pages. Position the RV on selection 1, ACQUISITION CONTROL. Press the MENU button and Setup Page 1 will appear on the display. Each of the titles listed on the left side of the display represents a control field or a numerical entry parameter (i.e., control fields that require entry of a specific numerical value such as TRIG THRESHOLD, TRIG DELAY, AVG TARGET COUNT, etc.). The SETUP direction buttons control which title, or field, is selected. Press the SETUP DOWN button, the menu displayed on the right will change as the RV moves from one field to the next. Position the RV on INPUT COUPLING. Menu item 1 (AC) is highlighted by the RV. This indicates which menu item is selected. Placement of the RV on a menu is controlled by the SCROLL group UP/DOWN buttons. Scroll through the menu items using the SCROLL DOWN button. When finished, select menu item 1, AC, for both channels (when a separate menu exists for each channel, the SETUP LEFT/RIGHT buttons are used to move the RV from one channel's menu to the other).

Press the PAGE ADV button and the INPUT/PROCESS CONTROL page will appear on the display. The PAGE ADV button is used to step through each Setup Page without having to return to the Setup Page Listing.

Many of the controls on these pages are the same as the controls accessible in the normal display mode. Displaying the SETUP pages is simply another way to get at those controls (as well as quite a few that are not available in a regular display). Use the SETUP group UP/DOWN buttons to position the RV on FREQ. RANGE (HZ) and, using the SCROLL group UP/DOWN buttons, select 20kHz.

Position the RV on F.S. INPUT LEVELS. Using the SCROLL UP/DOWN button, select 2V for Channel A. Press the SETUP RIGHT directional button to position the RV on the Channel B Input Level menu and, using the SCROLL UP/DOWN directional buttons, select 10V for channel B.

Press the PAGE ADV button and the DISPLAY SELECTION PAGE will appear. Press the SCROLL DOWN button to select TIME.

Press the SETUP ON/OFF button to exit the Setup Page display. Observe the right-most field in the top line of display annotation. The 20kHz selection you made from the INPUT/PROCESS CONTROL Setup Page will be reflected here. Located on the right-hand side of each display grid are the control fields for Input Level and Input Coupling. Note that the selections you made for these control fields from the Setup Pages are reflected here. TIME & SPEC information should be displayed, indicating the Function selection you made from the DISPLAY SELECTION Setup Page.

Note that when you pressed the SETUP ON/OFF button to exit the Setup Pages, the instrument went directly back to the data display and bypassed the Setup Page Listing. If you press SETUP ON/OFF again, the last Setup Page displayed will appear, bypassing the Setup Page Listing once again. If you want the Setup Page Listing to appear when you access the Setup Pages from the data display, you have to exit the Setup Pages by pressing the MENU button first, before pressing SETUP ON/OFF. Now when SETUP ON/OFF is enabled (from the data display), the Setup Page Listing will appear first.

1-3.2 Signal Data Acquisition Channels (single channel users can skip to UPDATE MODE)

Observe the TIME & SPECT display. This is a single channel function. The selected input level for channel A is located just to the right of the the upper trace. Note that, in addition to the Input Level control field, the control field for Channel A Input Coupling is also located here, and, just below these control fields is a bar graph indicating the overall rms level of the input signal.

Press the INPUT MEMORY SEL CHAN button and observe that the top line of annotation on each trace now says TIME B and SPEC B instead of TIME A and SPEC A.

Press the INPUT MEMORY HOLD button and observe the upper trace. Select Channel B again and press the INPUT MEMORY UPDATE button. Press the FREQ FIELD LOCATOR to position the RV on the FR 20kHz field. Select 10kHz using the SCROLL DOWN button. Observe the data and press HOLD again. Watch the X-axis numbers and, using the SEL CHAN button, return to channel A, and then press HOLD. Any change made to one channel does not affect the other (non-displayed) channel if HOLD is pressed before changing channels. This applies only to single channel functions.

UPDATE MODE

The following information describes how to select the various update modes. Changing the update mode requires accessing Setup Page 1, the ACQUISITION PAGE, as this particular menu cannot be accessed via the data display. Access Setup Page 1 and position the RV on the UPDATE MODE field using the SETUP UP/DOWN buttons. Select menu item 2, SINGLE(AMP) TRIG (internal single trigger) using the SCROLL UP/DOWN buttons. Using the SETUP UP/DOWN buttons, position the RV on the TRIG THRESHOLD control field and press 2,0, and ENT on the ENTRY keypad. This selects a 20% threshold trigger level. Any input signal that exceeds 20% of the full-scale display produces a trigger that initiates data acquisition. Press the SETUP ON/OFF button to exit Setup Page 1 and return to the data display. Set the output level on the oscillator to minimum and press UPDATE. Slowly bring the output level back up and observe the LED located on the INPUT MEMORY group UPDATE button and the TRIG LED located just to the right of the SEL CHAN button. When the TRIG LED lights, signal

acquisition occurs and the trace will be updated. If 32k samples occur prior to the next trigger occurance, the Input Memory will be full causing the update LED to go out and data acquisition to stop. The next trigger will restart the cycle. The output level of the oscillator is the signal acquisition level. This reading should be approximately 0.4V (20 % of the 2V full scale).

Another method of changing trigger threshold levels is using the %TH button located in the ENTRY group. Press %TH, 5, 0 and ENT. A 50 % threshold is now selected. Press UPDATE and slowly increase the oscillator output level. The trace should update at approximately 1V.

Press the SETUP ON/OFF button to display Setup Page 1. Select Internal Repeat Trigger (UPDATE MODE menu item 3) and press the RESET and UPDATE buttons. The UPDATE LED will flash, indicating the trigger is rearmed after each display. A low frequency signal (approximately 200 Hz) will demonstrate the phase consistency of this triggering technique.

Decrease the output level to minimum and observe that triggering stops. Press %TH, 1, 0 and ENT. Set the output level to 1V.

1-3.3 Signal Data Processing

Once the data has been acquired (brought into the Input Memory in accordance with the selected update mode, etc.) the operator may want to process it further for more informative measurements.

The single channel Function Groups (SPECTRUM, TIME and STATISTICS) contain all the Real Time processing capability of the instrument. (The groups which become available with the 2 channel option require Average or Storage memory for their displays).

Perform a Panel-Zero-Recall. Press the UPDATE and FREQ buttons. Select the 5kHz frequency range and adjust the oscillator for an output of approximately 2.5kHz. Vary the output frequency and amplitude while observing the upper trace.

Press the FUNC FIELD LOCATOR, the SETUP UP and the SCROLL DOWN buttons to select the TIME Function Group. Again, change the output frequency and level while noting the differences between this and the previous display.

Press the SCROLL DOWN button to select GRP STAT (Statistics). Again, observe the differences while changing the oscillator frequency and amplitude. Return to the GRP SPEC display.

The preceding has been a basic demonstration of what can be processed in Real Time: amplitude vs. frequency (SPECTRUM), amplitude vs. time (TIME) and sample occurrences vs. amplitude (STAT).

Press the BAND FIELD LOCATOR button and the SCROLL DOWN buttons to select the ZOOM feature. Observe the upper trace calibration change. Press the SCROLL group ZOOM button. This enables the selected ZOOM factor to be changed via the SCROLL UP/DOWN buttons. Press the SCROLL UP button twice to select a ZOOM factor of 8. This is indicated by the annotation ZM8 located slightly left of center on the line under the upper trace as shown in Figure 1-9. Press ZOOM again, the LED will go out indicating the ZOOM factor selection has been disabled.

Special circuitry in the instrument samples data around a specified "center frequency." Set your signal generator to 300 Hz. The signal is not seen on the display since it is outside the defined window.

Located in the ENTRY group is a button labeled CF. Press CF, 3, 0, 0 and ENT (thereby entering 300 Hz for the center freq.). The 300 Hz oscillator signal should now appear at the center of the display. Note the changes in the X-axis calibration.

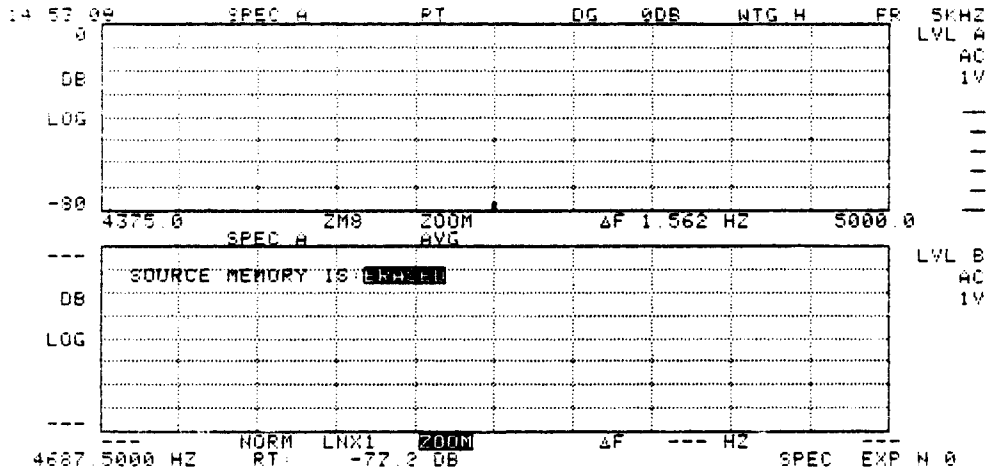

Figure 1-9. The ZOOM Display

Adjust the oscillator for an output of approximately 400 Hz. Position the cursor on the peak of the signal using the CURSOR group directional buttons. Now press CF again and note that the number in the keypad display field, located in the upper right corner of the display matches the cursor frequency readout. Press ENT and this number will automatically be used for ZOOM CF. The signal should once again end up in the center of the display.

Move the signal back down to 300 Hz. Press CF again and move the cursor toward the signal using the CURSOR controls. Note the CF changes as the cursor is moved and each new frequency reading is automatically entered as the CF. When the signal is positioned in the center of the display, press ENT to exit this operation.

The ZOOM factor may also be changed via the Setup Pages. Display Setup Page 2 and position the RV on the ZOOM MULTIPLIER field. Notice the menu items range from 2 to 64 in power-of-two steps. Using the SCROLL buttons, select 16 and press the SETUP ON/OFF button.

DATA AVERAGING & STORING

Averaging of the signal data often reveals a great deal of valuable information. Basically, averaging is loading data into the Average Memory. This is initiated by pressing the AVERAGE group START button.

Adjust the oscillator for 200 Hz at 1V, and perform a Panel-Zero-Recall. Press the FUNC FIELD LOCATOR and select GRP TIME using the SCROLL DOWN button. The analyzer is now in the TIME & SPEC function. Both Time and Spectrum data are presented on the display as shown in Figure 1-10. Pressing the AVERAGE START button will result in Spectrum data being averaged. The AVERAGE DATA menu, located on Setup Page 2, determines the type of data to be averaged (Time, Spectrum or Cross-Product.)

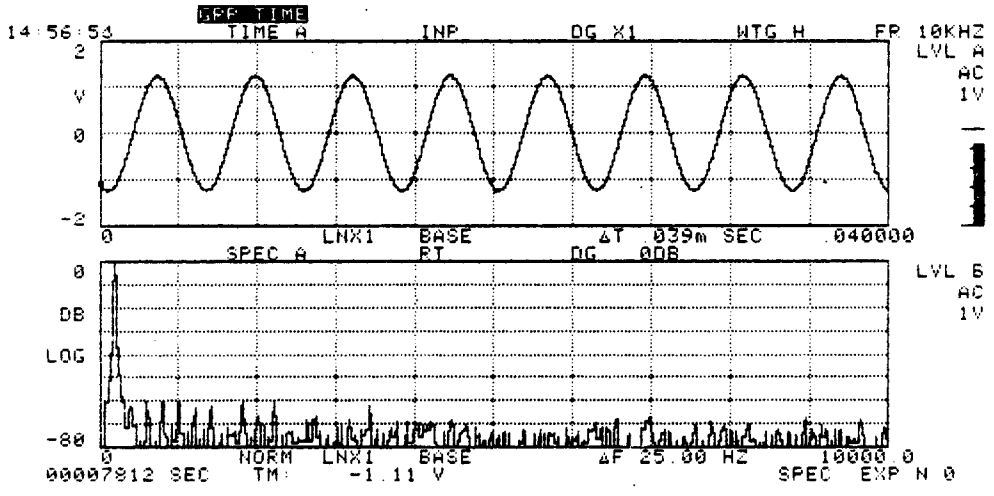

Figure 1-10. The TIME & SPEC Display

Press the AVG FIELD LOCATOR and SCROLL UP buttons to select TIME data averaging. Notice the function annotation title TIME A has the word SYNC added to it. This indicates time-averaged data are being used for the display. Figure 1-11 is an example of a SYNC TIME display.

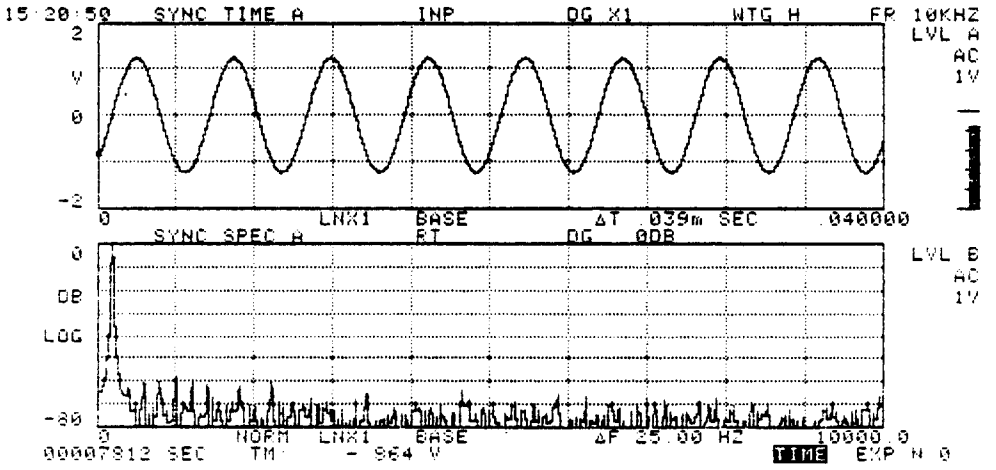

Figure 1-11. The SYNC TIME Display

Real-time (Input Memory) data are being displayed on both traces. The upper trace data are shifting with each update. This is because each data acquisition occurs at different points of the input signal.

Press the MEM FIELD LOCATOR and SCROLL DOWN buttons to display the contents of the Average Memory.

Press AVERAGE START and observe both traces. The variations in amplitude are caused by non-synchronous data acquisitions. Press SCROLL UP to return to the Input Memory. Display Setup Page 1 and select UPDATE MODE menu item 4, REPEAT (AMP) TRIG. Press SETUP ON/OFF and position the RV on GRP TIME. SCROLL UP to select the Spectrum group. Press the AVERAGE STOP, AVG locator and SCROLL DOWN buttons to select spectrum-data averaging. Press AVERAGE CONT and note the message on the right side of the display as shown in Figure 1-12. If new data to be entered into the Average Memory are not compatible with data already acquired, this message will appear. The conflict will be highlighted by an RV.

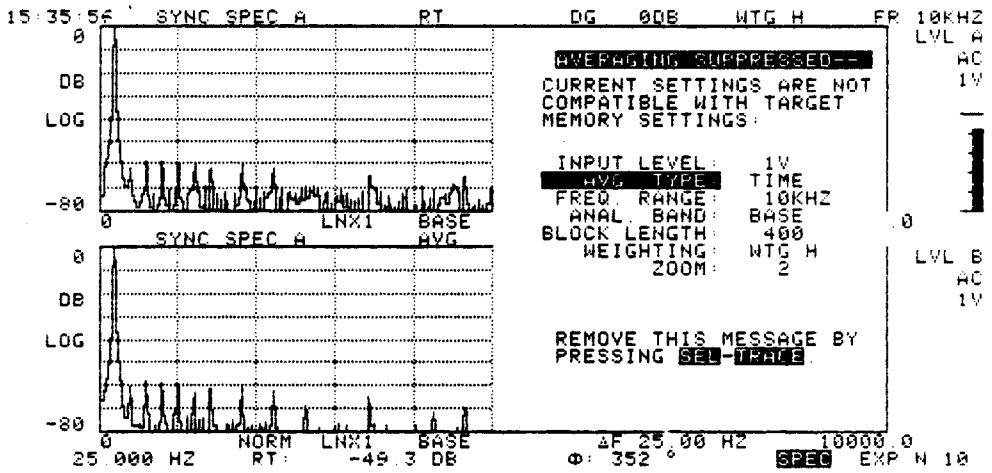

Figure 1-12. Average Error Message

Press AVERAGE STORE to store the time-averaged data, then press AVERAGE START. The suppression message will disappear from the display.

Press the FUNC FIELD LOCATOR, SETUP UP and SCROLL DOWN buttons to select the TIME function. The time waveform is now steady. This is why SYNC is used to describe the use of time-averaged data. Note that the average continues but that the time trace is the INP (Input or real time) memory. It is not possible to display time data from an average memory containing spectrum data, the only available time data is the current input. The spectrum display is still averaged data, however.

Press SCROLL DOWN to select the STAT (Statistics) function group. The Statistics group requires either a time average or an average of AMPLITUDE DOMAIN (PDH). This function is not compatible with the current contents of the Average Memory. Note the message in the lower trace: SOURCE MEMORY IS: MAG^2. The instrument cannot display PDH data from an FFT source. Press the SEL TRACE button to remove the suppression message.

Press the MEM FIELD LOCATOR and SCROLL DOWN buttons to select the RT & STO display. The lower trace is a PDH performed on the time-averaged data stored previously. Since time-averaged data are being used, the function title is SYNC PDH. Figure 1-13 is an example of a SYNC PDH display.

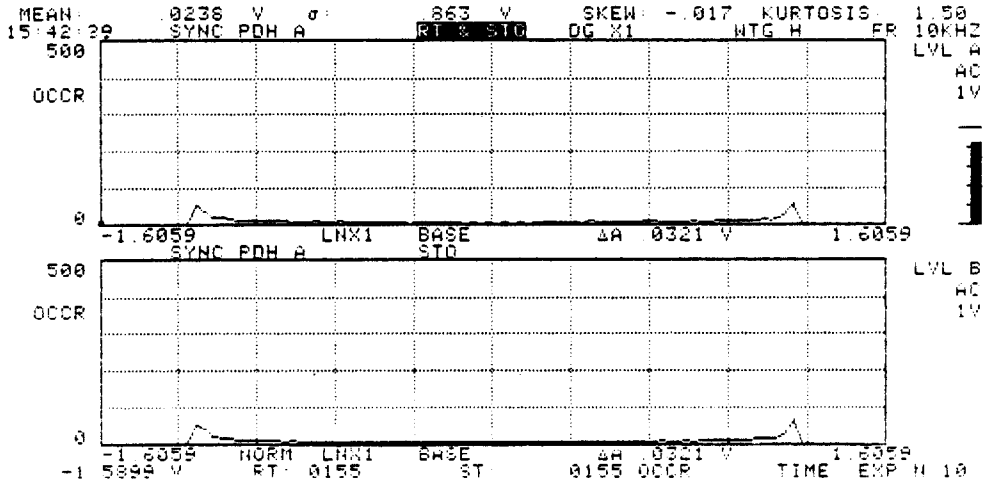

Figure 1-13. The SYNC PDH Display

Return to the RT & AVG display by pressing the SCROLL UP button. Press the AVERAGE START button, wait a few seconds, and press AVERAGE STOP. Press the SETUP LEFT and UP buttons to position the RV on GRP STAT. Press the SCROLL UP button twice to select the Spectrum function. Note the message displayed in the lower trace: SOURCE MEMORY IS: PROBAB DENS.

Two-Channel Averaging (single channel users can skip to SUM, EXPO and PEAK)

Select channel B using the INPUT MEMORY group SEL CHAN button. Press AVERAGE START, wait a few seconds and press STOP. Press the FUNC FIELD LOCATOR once, and the SCROLL DOWN button twice, to select 2 CH SPECT. Press the MEM FIELD LOCATOR and SCROLL DOWN buttons to display the Average Memory contents. Note that the Channel A averaged trace is not displayed. This is because the Average Memory for channel A still contains the PDH data. Press AVERAGE START, wait about ten seconds, and press STOP. Because this is a two-channel function, both channels of Average Memory have been updated. Press the FUNC FIELD LOCATOR button once, and the SCROLL UP button twice to return to the single channel Spectrum function.

Channel B data are being displayed. Even though this data was acquired in a two-channel mode, there is no conflict and the unit displays the channel B averaged data. Press AVERAGE START/STOP and return to the 2 CH Spectrum display using the SCROLL DOWN button. Note that only channel B is erased. The erase was performed while in a single channel function, with channel B selected. Therefore, only Channel B was erased.

Press AVERAGE START/STOP again, and channel A source memory will be erased. Press AVERAGE START, wait ten seconds and press STOP. Position the RV on GRP SPEC and, using the SCROLL DOWN button, select the Statistics function group (GRP STAT). The message displayed in the lower trace identifies the memory contents as being MAG^2 data. Transfer Function and Power functions require complex cross-products averaged data. Return to the 2 CH SPECT display by pressing the SCROLL UP button twice to select GRP SPEC. Press the AVG FIELD LOCATOR button. Press SCROLL DOWN to select cross-products average (XPRD).

Press AVERAGE START, notice there is no difference in the spectrum display (regular spectrum average is a part of the data averaged for XPRD). However, the averaged data will be suitable for the |TF| & ∠(TF & Phase) display. Press AVERAGE STOP and position the RV on GRP SPEC. Press the SCROLL DOWN button three times to select GRP TF.

It is also possible to cross-product average (XPRD AVG) in the background of a two-channel time display. This approach (setting the averaged data desired via a separate control) allows the user to view data of interest while performing the needed average. Example: impact triggering to input memory for review of the time data while performing a cross-products average for later TF, etc., frequency domain review.

Display the ACQUISITION PAGE and select the FREE RUN Update Mode. Press the SETUP ON/OFF and BAND FIELD LOCATOR buttons. Select ZOOM by pressing the SCROLL DOWN button. Press AVERAGE START to perform a XPRD of ZOOM data. Press AVERAGE STOP.

SUM, EXPO, PEAK

Not only can the operator select which data is averaged, but also how to average it. Perform a Panel-Zero-Recall to return to the single channel spectrum display. Press the UPDATE, FREQ FIELD LOCATOR and SCROLL DOWN buttons to select a frequency range of 500 Hz. Press the AVG FIELD

LOCATOR and SETUP RIGHT buttons to position the RV on EXP. Press MENU to display the AVERAGE MODE menu. The following procedures will illustrate these different types of averaging.

Press the MENU button to turn off the menu, then press AVERAGE START. Vary the oscillator frequency from 100 to 300 Hz and observe the lower trace. The "old" data will slowly begin to "decay". Press AVERAGE STOP and the ENTRY group AVE #, 2 and ENT buttons. The number of averages performed is now two instead of ten. Press AVERAGE START and vary the oscillator frequency again. The old data are decaying much faster.

Press AVERAGE STOP and select SUM averaging by pressing SCROLL UP. Press START, and note that the average stops almost immediately. This is because the average count is 2. Press AVG #, 2, 0 and ENT. Press AVERAGE CONT and watch the number at the lower right corner of the display. When it reaches 20, the average automatically stops again.

Enter an AVG # of 22. Select + 1 AVG by pressing SCROLL UP. This is another version of SUM averaging that adds one "ensemble" of data to the Average Memory for each push of the START button. Push START and note that the count increments once to 21 and then the average stops. Push START and note the count is 22. Push START again, and observe the suppression message: TARGET COUNT REACHED as shown in Figure 1-14.

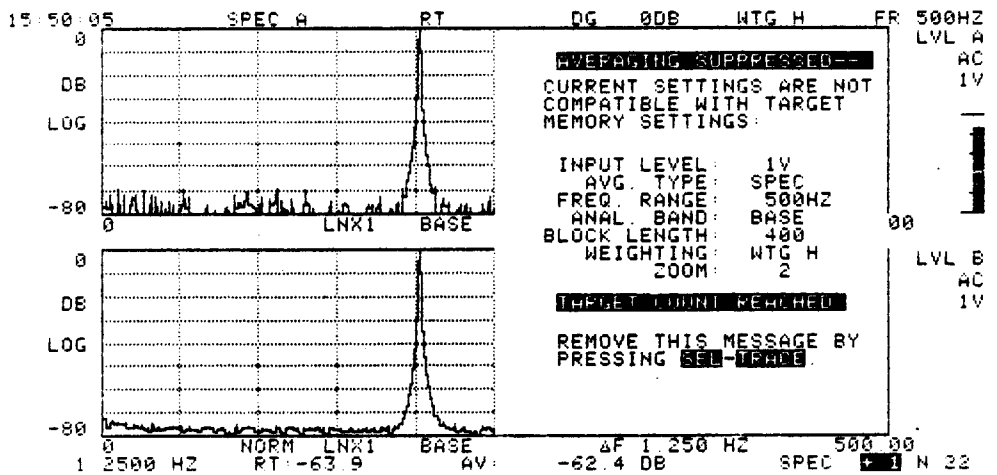

Figure 1-14. Target Count Suppression Message