SOUND TECHNOLOGY INC.

SECTION 2

3200B PROGRAMMABLE AUDIO ANALYZER

OPERATOR'S MANUAL

Version 1.2 December 28, 1989

3200B ANALYZER FRONT PANEL

This illustration shows the 3200B front panel with its 10 main pushbutton groups. Each group is explained in the following sections.

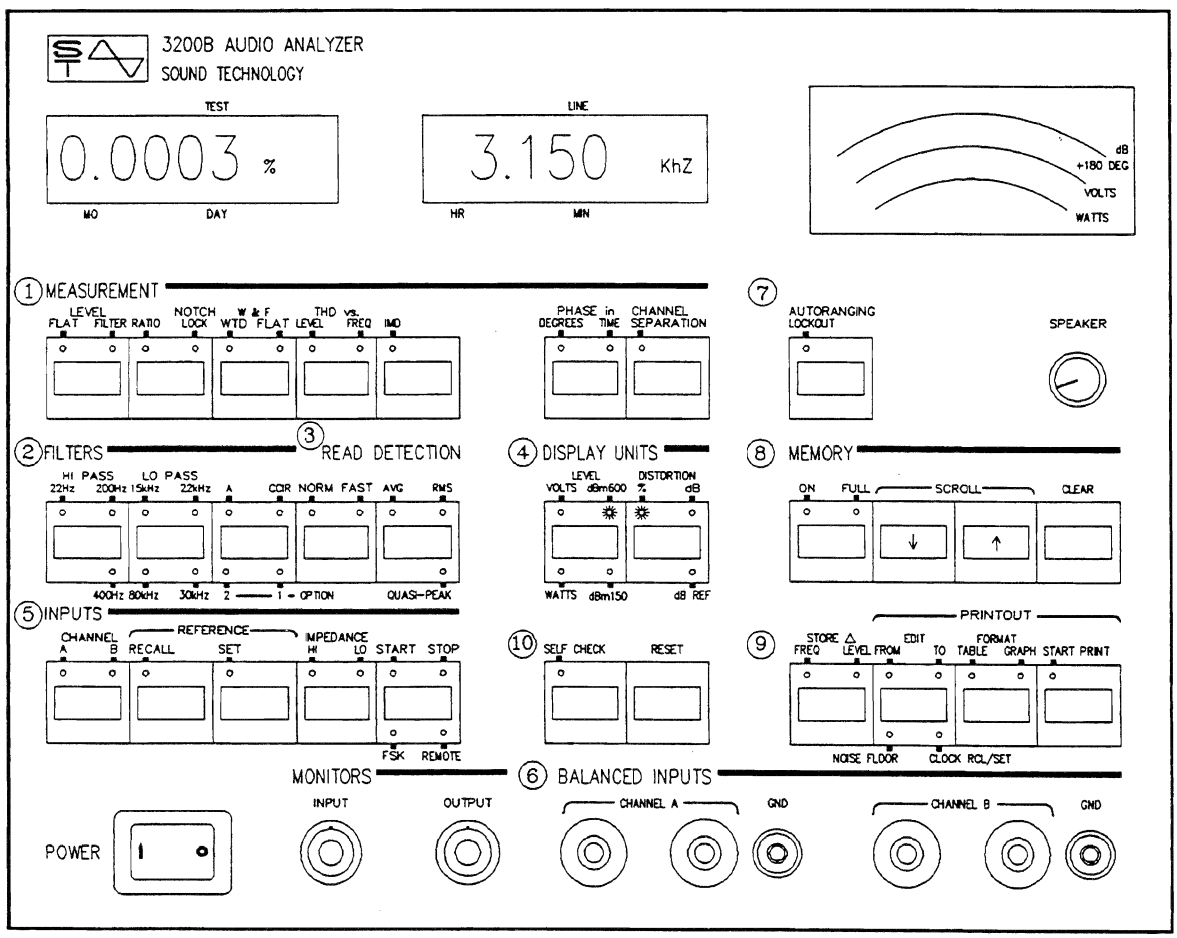

Figure 2-1

The 10 groups on the 3200B front panel are:

1	MEASUREMENT
2	FILTERS
3	READ / DETECTION
4	DISPLAY UNITS
5	INPUTS
6	BALANCED INPUTS
7	AUTORANGING
8	MEMORY
9	PRINTOUT
10	SELF CHECK / RESET

Information about each group is contained in the Paragraph Group number.

1. MEASUREMENT

The 3200B Analyzer can be operated as a manual device, or under full automatic control of the 3100B Generator. Information about automatic control is covered in the 3100B Generator section 7 - PROGRAM. Anything that can be done manually can be duplicated by the Autosequence functions of the 3100B. This section explains the manual functions.

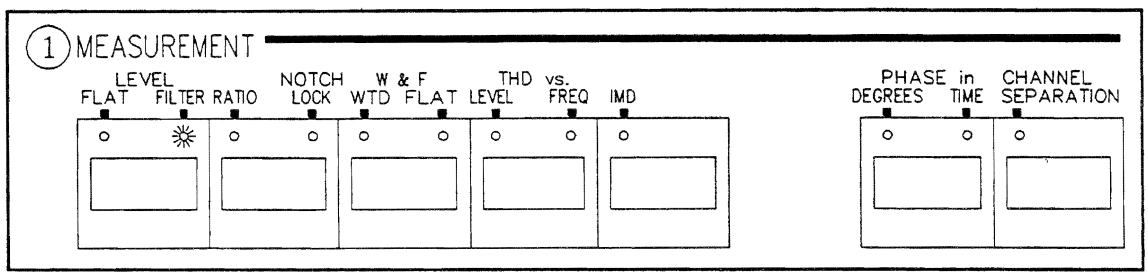

Figure 2-2

This illustration shows the **MEASUREMENT** group, with the **LEVEL [FILTER]** function active. As with the 3100B Generator, each pushbutton has from 1 to 4 functions, plus OFF. Each time a button is pushed, the functions will advance clockwise, with the LED indicating the current mode.

TYPICAL LEVEL MEASUREMENT SETUP

A full setup for level measurements includes selections from these parameter groups (refer to the illustration of the 3200B Front Panel):

GROUP	SELECTION
1 MEASUREMENT	**LEVEL [FLAT - FILTERED]**
2 FILTERS	**HI PASS [22 Hz - 200 Hz - 400 Hz]**
2 FILTERS	**LO PASS [15 kHz - 22 kHz - 30 kHz - 80 kHz]**
3 READ	**[NORMAL - FAST]**
3 DETECTION	**[AVERAGE - RMS - QUASI-PEAK]**
4 DISPLAY UNITS	**[VOLTS - dBm 600 - dBm 150 - WATTS - dB REF]**
5 INPUTS	**CHANNEL [A - B - A & B] REFERENCE [SET - RECALL] IMPEDANCE [HIGH - LOW] [STOP - START]**
7 AUTORANGING	**[NORMAL] [LOCKOUT]**
8 MEMORY	**[ON] [SCROLL] [CLEAR]**
9 PRINT	**[STORE DELTA] [EDIT] [FORMAT] [PRINT]**
10 SELF CHECK / RESET	**[SELF CHECK] [RESET]**

While this list of parameters seems lengthy, the 3200B "remembers" the previous setting of each pushbutton. If you change 1 setting, all others remain as they were. When you turn the analyzer off at the end of a session, it will start up with the same settings.

1.1. LEVEL

Incoming signal levels can be measured on either channel or both, and in **[FLAT]** or **[FILTERED]** mode. If you select a single channel, the LED Display shows the level in the left window and frequency in the right. When both channels are selected, the LED Display shows the level of both channels. The display shows levels according to the setting of **DISPLAY UNITS.**

No filters or weighting can be used when **LEVEL [FLAT]** is selected. When **LEVEL [FILTER]** IS selected, both **HI** and **LO PASS** filters and all weighting networks can be used. Paragraph 2 explains filters and weighting.

The noise floor of the 3200B is 3 μvolts which permits accurate measurements from 30 μvolts to the upper limit of 100 Volts. The bandwidth is > 300 kHz.

1.2. RATIO

Ratio level measurements are relative to the current **REFERENCE**, and all filters and weighting are available.

To set a Reference:

Select	**LEVEL [FLAT]** or **[FILTER]** When a signal is applied to the inputs, and the analyzer is in **[START]** mode, the LED Display will show the incoming signal level. After making any necessary gain adjustments:
Press	**REFERENCE [SET]**
Press	**MEASUREMENT [RATIO]**

The LED Display now shows the incoming signal level *RELATIVE* to the signal at the time the reference was set. For example, if the incoming signal was 1 kHz at +8 dBm when the reference was set, and you switch to RATIO, the reading will be 0 dBr.

This feature is used for signal-to-noise and frequency response tests when you want the measurements to be relative to the reference.

1.3. NOTCH LOCK Option 010

Note: this function is optional. Check the option tag on the rear panel to verify if it is installed.

Notch Lock provides a special THD (Total Harmonic Distortion) test that measures noise relative to the reference level *in the presence of a low-level signal.* It is used to measure noise on an audio signal or quantization noise in digital audio circuits. The left LED Display shows the measurement in dBr, and the right display shows the input level. All filters and weighting can be used.

NOTCH LOCK measurements are level- and time-sensitive. The measurement should be made with an output from the device under test (ie the input to the 3200B) at least 10 db above its noise floor. Valid readings can be made for approximately 30 seconds. Tests can be made on 1 channel at a time.

Set a Reference (see Paragraph 1.2 above) with the desired operating level (at least -38 dBU or higher). Then:

Select	Generator frequency and the level used for the set reference.
Select	Analyzer **MEASUREMENT [NOTCH LOCK]**
Press	**[START]** on the 3100B
Press	**[START]** on the 3200B When a reading appears in the left LED Display (about 7 seconds) reduce the generator level to a level that will result in output from the device under test at least 10 mv above its noise floor. The reading

should be made within 30 seconds after reducing the generator level.

We recommend connecting an oscilloscope to the 3200B output monitor so that you can observe when the notch starts to drift. This is especially important if the noise level of the device under test is not stable, making it difficult to determine from the readings in the left LED window when the notch has drifted.

Note: When additional Notch Lock tests are to be done, you must press the 3200B **START** when the high level signal is applied. The notch is locked as soon as the high level signal has been measured. If you don't restart the analyzer after the signal level has been increased, the notch will not be locked.

Note: The reading test should be started with a signal level high enough to cause the THD notch filter to reach a good null. The actual level depends on the noise, but a signal of 0.1 Volts or higher is usually sufficient.

1.4. WOW and FLUTTER Option 012

Check the Option Tag on the rear panel of the Analyzer to verify Option 012 is installed. Unless the option is included in the 3200B, the LED will not light.

Wow and Flutter measurements can be made either FLAT or WEIGHTED according to these standards:

1	NAB	3.0 kHz	AVG Detection
2	JIS	3.0 kHz	RMS Detection
3	DIN/ANSI/IEC	3.15 kHz	QUASI-PEAK Detection

The frequency window for Wow and Flutter test is from 2 kHz to 5 kHz, but the standard frequencies are listed above. Only 1 channel can be operated for Wow and Flutter measurements. If **W & F [WEIGHTED]** is selected, the filters required by the standard are selected automatically.

1.5. TOTAL HARMONIC DISTORTION

Total Harmonic Distortion measurements are made in reference to LEVEL or FREQUENCY. In either case, only 1 channel can be measured at a time.

Distortion vs Level is used to measure THD in a level sweep. Delta Level must be set to the correct number of dB / step - see paragraph 9.

Frequency sweeps measure THD vs Frequency. Set Delta Frequency to correspond to the number of points per decade. See paragraph 9 in this section, and paragraph 4.8 and 4.10 in the 3100B Generator section for more information about Delta Level and Delta Frequency.

Distortion measurements are shown in the LED Display: the left window shows the distortion and the right window shows the level or frequency, depending on which test is being run. Distortion is expressed according to the 2 selections in the DISPLAY UNITS group:

1	Percent
2	dB

THD measurements can be made with the incoming signal level shown relative to the REFERENCE. Select **dB REF** by pressing the **LEVEL UNITS** button until the **dB REF** LED on the **DISTORTION UNITS** button is illuminated. In this case, the THD measurement is referenced to the input level, but the level is displayed in dB relative to the current REFERENCE.

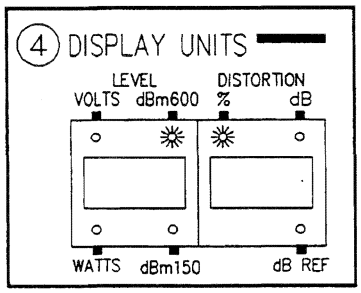

Figure 2-3

1.5.1. DYNAMIC RANGE

The Dynamic Range of an amplifier is defined as the ratio between the level which produces the maximum allowable distortion (usually at 1 kHz) and its noise floor. This application procedure can easily be performed with the 3100B Generator and 3200 Analyzer:

Set the generator to the required Sine Wave frequency and a level known to be within the normal operating range for the device under test. Select either Channel A or B.

On the 3200B Analyzer:

Select	**CHANNEL [A or B]** as required.
Select	**MEASUREMENT [THD vs LEVEL]**
Press	**[START]** on the generator and analyzer.
	Increase the output level of the generator (the Vernier button can be used) until the distortion shown on the LED Display of the analyzer is the maximum allowable for the amplifier.
Press	**REFERENCE [SET]** - see paragraph 5.2.
Select	**MEASUREMENT [RATIO]**
Select	GENERATOR - both channels OFF.
Read	The noise ratio from the LED Display on the analyzer. This figure is the Dynamic Range of the amplifier.

1.6. IMD Option 004

IMD is an option. The Option Tag on the rear panel of the analyzer will verify if it is installed.

The Intermodulation Distortion test uses the SMPTE standard of 60 Hz and 7 kHz in a 4:1 Ratio. As with THD, only 1 channel can be measured at a time, and results are displayed in dB or percent according to the selection of the DISTORTION UNITS group. The distortion is shown in the left LED Display, and the level (in units selected from the LEVEL UNITS group) in the right window. No filters can be used with IMD measurements.

1.7. PHASE

Phase measurements compare the input to Channel A (which is the reference) with that of Channel B and display the error in the left LED Display.

Select	**MEASUREMENT [PHASE]** in degrees or time.
Press	**CHANNEL [A and B]**
Press	**START**

The frequency is shown in the right display. Phase error (± 180°) can be shown in degrees or time, and can be measured between 10 Hz and 40 kHz. Filters can not be selected.

1.8. CHANNEL SEPARATION

Channel separation or crosstalk can be measured on either channel. Frequencies from 10 Hz to 100 kHz may be used, and all filters and Average or RMS detection can be selected.

To measure crosstalk into CHANNEL B:

Select	**MEASUREMENT [CHANNEL SEPARATION]**
Select	**INPUTS [B]**
Select	Filters and Detection as required.
Press	**START**

Insert a known signal into Channel A. The separation or crosstalk measurement will be shown in dB in the left LED Display, and the frequency in the right Display.

If you are using the 3100B Generator for this test, you would set its output to CHANNEL A. The undriven generator channel will be terminated with the SOURCE OHMS.

During Autosequence CHANNEL SEPARATION tests, FSK codes automatically control the setting of the generator outputs and analyzer inputs.

2. FILTERS and WEIGHTING

The 3200B includes a comprehensive filter and weighting group that can be used for all measurements except FLAT LEVEL, IMD, and PHASE.

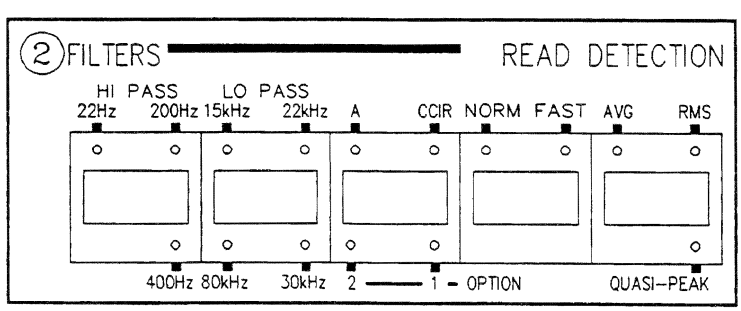

Figure 2-4

The illustration above shows the 22 Hz HI PASS and 22 kHz LOW PASS filters ON.

2.1. FILTERS

Range:

HI PASS	dB/Octave	LO PASS	dB/Octave
22 Hz	18	15 kHz	18
200 Hz	36	22 kHz	48
400 Hz	18	30 kHz	18
OFF	n/a	80 kHz	18
		OFF	n/a

The 200 Hz HI PASS slope is 36 dB per octave. This steep slope can be used to measure noise in circuits which include companders. A low frequency (for example - 50 Hz which will be attenuated by the filter to about -70 dBm) can be sent to keep the compander open, and the residual level after filtering gives an indication of the circuit noise above 200 Hz.

Filters may be used with RATIO, LEVEL FILTER, NOTCH LOCK, CHANNEL SEPARATION, and THD. One HI PASS and one LO PASS can be selected for bandpass measurements.

When filters are used with THD, they effect only the distortion component, not the amplitude.

2.2. WEIGHTING

Range	"A"	Per NAB E-416	Use AVG Detection
	CCIR/ARM	Dolby Labs S77	Use Average Detection
	CCIR 468-2	DIN 454-5	Use Quasi-Peak Detection
	Option 1 and 2	Contact Sound Technology for details.	

Weighting may be used for RATIO, LEVEL FILTER and THD measurements.

3. READ / DETECTION

These functions are active for all measurements:

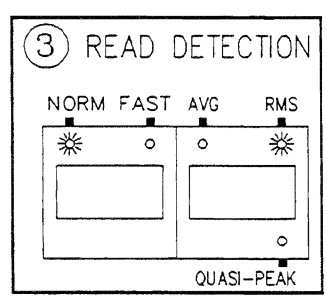

Figure 2-5

3.1. READ SPEED

In FAST mode, the time allowed for settling is reduced to enable a faster overall look at the incoming signals. During level and frequency sweeps, the TIME MULTIPLIER used by the 3100B Generator controls the speed of the sweep. If the multiplier is less than those listed in the Time Multiplier Table (see APPENDIX) some data may not be captured with the FAST speed. Select NORMAL read speed for more accurate results. Under some conditions - for example when measuring through steep filters, the time multiplier may have to be increased beyond the values indicated in the Table.

3.2. DETECTION

Range:

AVG = Average		Full wave rectified average.
RMS = Root Mean Square		Crest factor up to 6.
QUASI-PEAK		Per DIN 45404 and CCIR-468-2.

Detection can be selected for all measurements except PHASE.

4. DISPLAY UNITS

The 3200 Analyzer has two digital LED displays plus an analog meter.

The LED displays indicate 2 of the 3 measurements which may occur on each test. The 3rd measurement is only available on a printout from the analyzer.

The analog meter is not calibrated, but is useful for adjusting for peaks or nulls in a DUT. Do not attempt to read absolute levels from this meter.

The 3200B has several options for displaying levels and distortion which apply to all test functions except PHASE and CHANNEL SEPARATION.

4.1. LEVEL UNITS

Range:	dBm 600	Ratio of input level to 774.6 mV @ 600 Ohms.
	dBm 150	Ratio of input level to 387.3 mV @ 150 Ohms.
	Volts	Absolute level in Volts.
	Watts	Power across a specified load (1-99 Ohms).
	dB REF	Ratio of input level to the reference level.

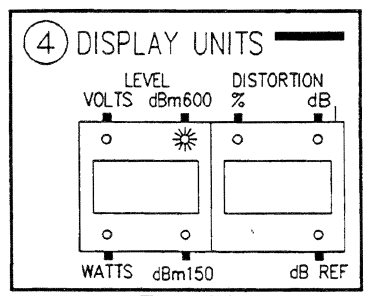

Figure 2-6

Total Harmonic Distortion tests can use all level units including dB REF (which is selected with the **LEVEL UNITS** switch). Distortion is always measured relative to the input signal and can be expressed in dB or percent. If the dB REL function is active, distortion can be shown in either dB or percent referenced to the signal level, and the level is shown relative to the REFERENCE level.

LEVEL, NOTCH LOCK and INTERMODULATION DISTORTION tests can use all level units except dB REF.

RATIO tests automatically use the dB REF setting. A valid reference must be set into the analyzer prior to making RATIO measurements. You can always press **REFERENCE [RECALL]** to verify the current reference.

PHASE, WOW AND FLUTTER and CHANNEL SEPARATION tests automatically bypass the LEVEL UNITS function.

5. INPUTS

The INPUT group controls the routing of signals through the analyzer.

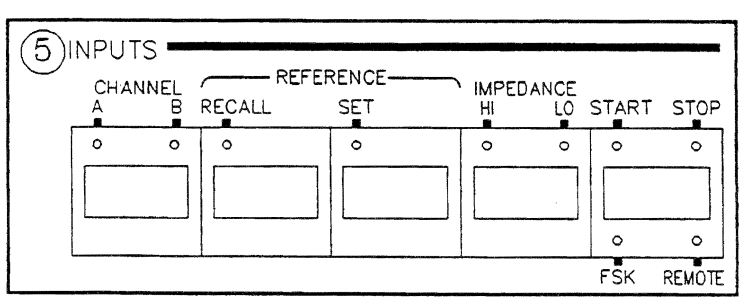

Figure 2-7

5.1. CHANNEL

The CHANNEL pushbutton can be pressed to select either or both channels. Distortion tests don't permit the use of both channels; unless you select a single channel, the analyzer will automatically switch to CHANNEL A. You may of course change to CHANNEL B if required.

PHASE test require both channels to be ON. CHANNEL B compares any error against the input of CHANNEL A and shows the reading in the LED Display.

CHANNEL SEPARATION tests require a single channel. To measure crosstalk in CHANNEL B, select this channel and insert a known signal into CHANNEL A.

5.2. REFERENCE

Use these 2 pushbuttons to RECALL or SET a reference into the analyzer memory. Any settings will remain active until they are changed. When the analyzer is first turned on, you should check or reset the reference as required.

SET a REFERENCE

Select	**MEASUREMENT [FLAT], [FILTER], [THD vs LEVEL or FREQ]**
Select	**INPUT [CHANNEL A, B or A & B]** and **[IMPEDANCE HI or LO]**
Press	**START** *After setting gain controls for the proper signal level:*
Press	**REFERENCE [SET]** *The LED button on this pushbutton will blink.*
Select	**MEASUREMENT [RATIO]** *Level measurements will be compared to the Reference Level.*

A reference set stores both the frequency and level for each active channel. This makes it possible to have a different reference set for each channel. To avoid surprises, you should recall the reference(s) before making a test!

You may **RECALL** the reference while the analyzer is in **[START]** by pressing **REFERENCE [RECALL]**. The current reference will be displayed momentarily in the LED Display windows. When the analyzer is in **[STOP]** mode you can check the stored reference by pressing **[RECALL]**. If both input channels are selected, the stored reference level for each channel will be displayed in the LED Windows. To display both the frequency and level for each channel, select one channel and press **[RECALL]**. The level is displayed in the left LED Window, and the frequency in the right. Repeat to view the frequency and level for the other channel.

When running Autosequences, a REFERENCE can be set by the FSK Codes (10th digit = 1). The reference will be set when the analyzer reads a level measurement.

5.3. IMPEDANCE

The normal (HI) impedance of the 3200B is 100 kOhms each side to ground, for an effective balanced input impedance of 200 kOhms. Some test applications require the output of the device under test to be terminated with 600 Ohms. You can connect a terminating resistor across the outputs, and use the HI Input Impedance of the 3200B. You can also change the input impedance to LO (600 Ohms) and make the tests without the terminating resistor across the outputs of the device.

5.4. START / STOP

The STOP / START button is used to control the analyzer for manual testing. Under Autosequence control, these functions are controlled by FSK codes.

6. INPUTS

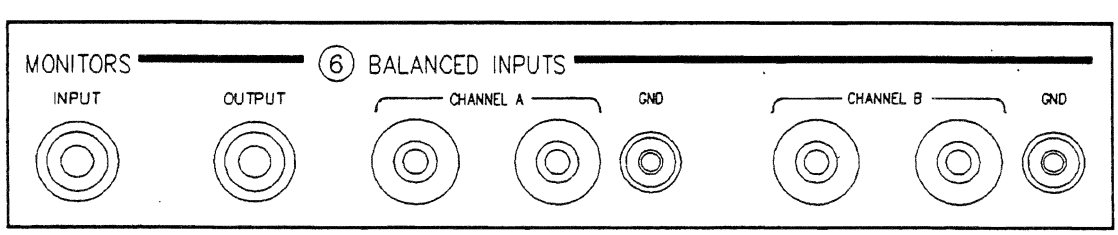

Figure 2-8

6.1. BALANCED INPUTS

The two sets of inputs are standard banana sockets, with an adjoining ground post for connecting a cable shield or for grounding one side of an unbalanced signal line. You can single-end either side to ground without loss of level or performance.

Type: Differential.

Level: 30 microvolts to 100 Volts, autoranging.

Frequency: 1 Hz to 300 kHz, rolled off above 300 kHz.

Impedance: HI - 100 kOhms, each side to ground for effective balanced impedance of 200 kOhms.

LO - balanced impedance of 600 Ohms.

6.2. MONITORS

Two signal monitors are provided:

INPUT A single-ended autoranged facsimile of the input signal is always available at this BNC connector to provide a convenient spot to connect an oscilloscope.

OUTPUT The signal is tapped after the filter network and before the detection circuit. This signal can be used to view the output of the distortion detector on an oscilloscope.

7. AUTORANGING

Signals received at the input to the 3200B go through an automatic ranging circuit with up to 130 dB gain. When consistent signals levels are being input, measurement speed can be increased if the AUTORANGING LOCKOUT is engaged. The lockout will not prevent the analyzer from changing to a higher range when the level of the incoming signal is increased. However, if the signal is then reduced in level, data readings may be missing due to the lack of autoranging.

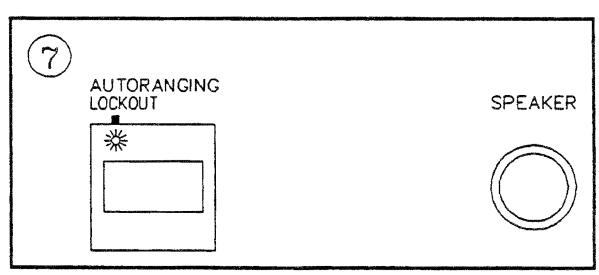

Figure 2-9

The 3200B has an internal speaker used for monitoring input signals. A volume control is located beside the AUTORANGING LOCKOUT.

8. MEMORY

The 3200 Analyzer has non-volatile internal memory for the automatic storage of test results. Up to 600 lines of data can be stored, with each data line containing either 2 or 3 parameters, such as Frequency, Level and Distortion.

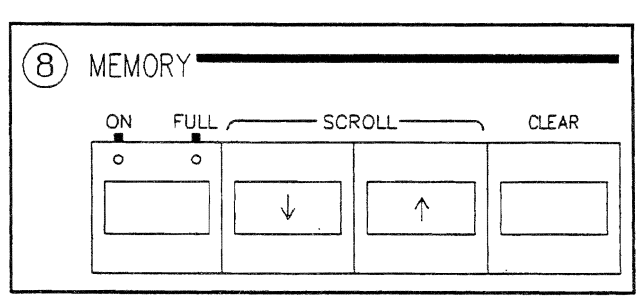

Figure 2-10

The data is stored in **MEMORY** and is divided into test numbers, starting with 1. Each time **MEASUREMENT, FILTERS, DETECTION, INPUTS** or **START** buttons are pressed (either manually or in Autosequences) the test number advances by 1 to a maximum of 99.

Autosequence test result printouts show the Autosequence number at the top of each page, and the test Panel Number is added to the header of each test number.

8.1. MEMORY FULL

If the quantity of incoming data exceeds the memory capacity, the **MEMORY FULL** LED turns on. The original data will be retained, and new data will be ignored. The memory is seldom filled with Autosequence results since you would usually clear the memory at the beginning of each run. However, when using the analyzer in manual mode, data will be continually recorded until the memory is full. It can be cleared manually - see paragraph 8.3 below.

8.2. MEMORY SCROLL

The MEMORY SCROLL buttons consists of [**UP/DOWN ARROWS**] and is a multifunction communication link between the user and the 3200B Analyzer.

	Function	Refer to Paragraph Number
1	Test Results	8.2.1
2	Delta Level	9.1
3	Delta Frequency	9.1
4	Edit Test Printouts	9.2.1 / 9.2.2
5	Clock Recall / Set	9.2.3
6	Noise Floor	9.2.4
7	Watts	10.1
8	Time Delay	10.2
9	Additional Test Samples	10.3

8.2.1. TEST RESULTS

You can scroll through the memory by pressing the [**UP/DOWN ARROW**] buttons when the MEMORY LED is on. While the scroll button is pressed, the Test Number is displayed in the left LED Display, and the location in memory is shown in the right. When the button is released, the results will show in the LED Display. The displays show the units of stored data as the test numbers are scrolled. While the analyzer usually accumulates 3 parameters with each measurement (such a frequency, level and distortion) only 2 can be viewed on the display window. A printout shows all appropriate parameters.

8.3. MEMORY CLEAR

Test results are stored in battery-protected memory until they are cleared, either manually or by a PURE OP Code panel sent in an Autosequence.

To clear manually:

Press **MEMORY [CLEAR] [CLEAR]**
You must press the CLEAR button twice in succession. This is a precaution to guard against accidental memory clearing.

In Autosequences, the memory is cleared when a panel with the PURE OP Code 56000 00000 is received by the analyzer.

9. DATA STORAGE AND PRINTOUT

The ninth group contains 4 pushbuttons:

1	STORE DELTA		
2	EDIT	CLOCK RCL/SET	NOISE FLOOR
3	FORMAT		
4	START PRINT		

9.1. STORE Delta

The 3200B Analyzer stores incoming frequency and level data which changes by a default value of ± 6% of the previous value. This works well with single frequency and level measurements, but sweeps require a suitable value in the Delta memory to ensure proper data storage.

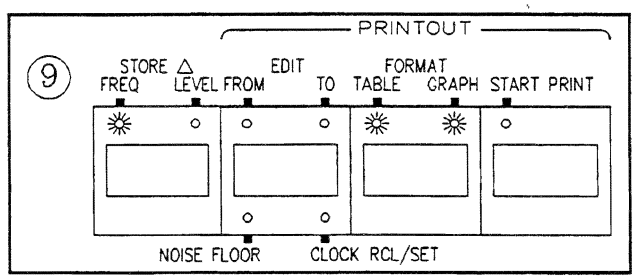

Figure 2-11

In Autosequences, the STORE Delta Frequency is set automatically by the 3100B Generator (Software Revision 3109B or higher). Earlier versions must use a PURE OP Code panel (see paragraph 7.4 in the Generator Section). The front panel controls are used to set Delta level or frequency when doing manual tests.

Example: A test uses a logarithmic frequency sweep with 12 points per decade (all set with the front panel of the 3100B Generator). To ensure the proper recording of this sweep, set the Delta Frequency to 12:

Set	Analyzer [**STOP**]
Select	**MEASUREMENT** - either [**FLAT, FILTER, RATIO,** or **THD vs FREQ**]
Select	**STORE Delta [FREQ]** *The LED will turn on.*
Press	**MEMORY SCROLL [UP / DOWN ARROWS]** *Continue scrolling until* { 1 2 } *appears in the LED Display.*

Assuming all other parameters of the analyzer are set, press [**START**] on the analyzer and then on the generator. The incoming sweep will be recorded properly.

The same procedure is used to set **DELTA Level** for level sweeps.

9.2. EDIT

The **EDIT** pushbutton has 4 functions:

1 and 2	FROM / TO	To select a range of tests for printing.
3	CLOCK RCL/SET	To display or set the internal clock.
4	NOISE FLOOR	To manually set the noise floor.

9.2.1. and 9.2.2. FROM / TO

All tests in an Autosequence are numbered starting with TEST 1. However, you may wish to print only a portion of the full test.

For example, you need a printout of tests 3, 4 and 5:

Select **PRINTOUT [EDIT FROM]**

Press **MEMORY SCROLL [Up / Down Arrows]**
Keep pressing until { 3 } appears in the right LED Display.

Select **PRINTOUT [EDIT TO]**

Press **MEMORY SCROLL [Up / Down Arrows]**
Keep pressing until { 5 } appears in the LED Display.

Press **PRINTOUT [START PRINT]**

The specified group of tests will be printed. Once the data is printed, the edit numbers will be erased. You can re-edit or print the full memory. These procedures can be repeated as often as needed, until you clear the memory with a new Autosequence or by pressing **[CLEAR] [CLEAR]** - that's right - press the button twice!

9.2.3. CLOCK RECALL / SET

The 3200B has an internal clock which provides a time and date stamp on Autosequence test printouts. When delivered from the factory, the time is set to Pacific Time. If you are in a different time zone, the clock should be reset:

Select **EDIT [CLOCK RCL/SET]**
The current time will show in the LED Display.

Press **[RCL/SET]** once.
When pressed once, the current minute digit(s) will blink. Change if required:

Press **MEMORY [UP/DOWN ARROWS]**
until the correct minutes are shown in the LED Display.

Press **[CLOCK RCL/SET]** once.
The current hour digit will blink.

Press **MEMORY [UP/DOWN ARROWS]**
until the correct hour digit is shown in the LED Display.

Repeat this procedure to set the day, month and year. When you have finished, press the **[CLOCK RCL/SET]** until all of its LEDs are off, or press any other front panel button. The new time will be set into memory.

You can press **[CLOCK RCL/SET]** once to display the current time. Unless you press it again, and use the **[UP/DOWN ARROWS]** the time will not be reset.

9.2.4. NOISE FLOOR

The 3200B has an automatic frequency counter which operates through the full range of 100 Volts down to the instrument noise floor of 3 μVolts. At these very low levels the frequency readings are often misleading, since signals and noise tend to blend to the point at which the counter may read the noise rather than the signal.

The Noise Floor - defined as the lower limit at which frequencies will be measured - can be set by PURE OP Code panels in an Autosequence (in millivolts or dB below 0 dBm), or manually in millivolts. Normal settings would be 5 to 20 dB above the noise floor of the device under test.

NOISE FLOOR - MANUAL SET

Select **EDIT [NOISE FLOOR]**
This is the last function of the EDIT button. Keep pressing this pushbutton (9 times) until you have cycled through the clock recall/set parameters.

Press **MEMORY SCROLL [UP/DOWN ARROWS]**
until the required level in millivolts is shown in the right LED Display.

Press **EDIT** or any other front panel button to return to normal operation.

The noise floor setting will stay in effect until it is changed either manually or by a PURE OP Code panel (60000 xxxx0 in mV -or- 63000 xx000 in dB) sent in an Autosequence.

9.3. FORMAT - Print

Use this function to specify tabular and/or graphic print formats.

Note: Graphic printouts can be made if the 3200B has option 011 GRAPHICS installed. Check the Option Tag on the rear panel.

PURE OP Code panels sent with an Autosequence can set the print formats automatically. Front panel controls are used in manual testing, and can also be used to reprint Autosequence results manually. In this latter case you can select either Tabular, Graphic (if installed) or both. If you select a manual print by pressing < **START PRINT** > you can abort the printout at any time by again pressing < **START PRINT** >. See paragraph 9.2.1 for instructions on editing a printout.

3200B Analyzers starting with Software Revision 3109B (units without Option 012 Wow & Flutter) or Revision 3201F (with Option 012) print graphic format automatically if the number of data points > = 7 and [**GRAPH**] is selected.

With earlier revisions, you can specify the number of data points per test required to trigger a graphic printout. When the number of points is less than the setting, graphic printout will be suppressed. If you select both graphic and tabular formats, all tests with the number of data points > = the setting will print graphically, and all tests will be printed in tabular format.

To set the number of data points manually:

Select **FORMAT [GRAPH]**

Press **MEMORY SCROLL [UP/DOWN ARROWS]**
until the required number of points is shown in the LED Display.

9.4. START PRINT

The contents of the analyzer memory can be printed manually by pressing this button. After the results are printed, you can get additional copies by pressing the button again. You can alternate between tabular and/or graphic printouts, and print as many copies as desired.

The 3200B stores test results in battery protected memory until the CLEAR MEMORY command is given - either manually or by a PURE OP Code panel in an Autosequence.

This feature can be used to accumulate test results at a remote location, after which the 3200B can be turned off and returned to a convenient printer. Connect the printer, and press START PRINT to get a hard copy of the results. You can choose either tabular, graphic or both formats without disturbing the memory contents.

9.5. SET TITLE FOR PRINTOUT

A title can be printed automatically at the top of each page of test results. The 3200B provides space in non-volatile memory for a title string up to 80 characters.

To add or edit a title, the 3200B must be connected to a terminal or computer via the RS-232 or GPIB port. (See Appendix C for RS-232 configuration information.) When you have established communication with the 3200, send the command **TITLE** followed by at least 1 blank space and then the desired title string, terminating with the normal end-of-line character for your computer or terminal.

When only 1 space is included after the command **TITLE** the string will start at the left margin of the page. The test result data starts at column 6; if you want the title to align with the test results, enter 6 spaces after the **TITLE** command. These spaces will be part of the maximum 80 character string that is entered.

The word **TITLE** is a command to the 3200, and will not be printed. It can be entered in upper or lower case. Any characters after the 1st space after the command will appear as a header on each page of test reports.

A typical GPIB command in the language of an Hewlett-Packard 85 desk-top calculator is:

```
100 OUTPUT 726; "Title      XYZ Co. Mobile Test Lab. Number 1."
```

10. OTHER INTERNAL SETTINGS

The 3200B has several other internal settings which can be set during Autosequences by PURE-OP Code FSK panels (see Section 1 Paragraph 7.4.1), or manually:

1	Watts	(OP Code 65000 xx000)
2	Time Delay	(OP Code 52000 xxxx0)
3	Test Samples	(Op Code 70000 x00yy)

10.1. WATTS

Level readings can be made in Watts with reference to a load of 1 Ohm to 99 Ohms. The 3200B must be set to the correct load impedance to ensure proper readings.

Set	Analyzer [**STOP**]
Set	**STORE DELTA** LEDs OFF
Select	**LEVEL UNITS [WATTS]**
Press	**[UP/DOWN ARROWS]** *until the correct load impedance is displayed in the left LED Display window.*

You can measure LEVEL (either Flat or Filtered), THD and IMD with the level expressed in WATTS. The LEVEL UNITS button can be pressed to change level readings to Volts, dBm 600 or dBm 150 without disturbing the current WATTS setting. Just press **LEVEL UNITS [WATTS]** to return to wattage readings.

10.2. TIME DELAY

A time delay can be introduced into a test to permit operator adjustment of the device, or to allow additional settling time. The range of delay is from 1 to 9999 milliseconds. While time delays are normally used in Autosequences in which the delay is set with the PURE OP Code 52000 xxxx0, they can also be used manually.

TIME DELAY - MANUAL SET

Set	**STORE DELTA LEDs OFF**
Set	**MEMORY** LEDs OFF
Select	Any **LEVEL UNITS** except **WATTS**
Select	**READ [NORMAL]**
Press	**MEMORY SCROLL [UP/DOWN ARROWS]** *until the desired time delay is shown in the left LED Display.*

When you press the **[UP/DOWN ARROWS]** the first digit is **0 ms**. You can scroll **[DOWN]** to jump immediately to **9999** and then downwards, or **[UP]** to advance up to the required delay. Once these settings have been made, the test can be run with the selected time delay.

10.3. ADDITIONAL TEST SAMPLES

Typical applications include testing devices which require a longer settling time, such as companders. This function affects readings of the currently set TEST MEASUREMENT. You can set from 0 to 20 additional readings which will then be averaged prior to the measurement being shown in the LED Display.

Additional Test Samples are usually set in Autosequences, using the PURE OP Code 70000 x00yy (see Section 1 paragraph 7.4.1) but may also be used for manual testing.
To set Additional Test Samples manually:

Select	Desired test measurement mode. *Additional Test Samples affect only the current test.*
Set	**STORE DELTA** LEDs OFF
Set	**MEMORY** OFF
Set	Any **LEVEL UNITS** except **WATTS.**
Select	**READ [FAST]**
Press	**MEMORY SCROLL [UP/DOWN ARROWS]** *until the desired number of Additional Test Samples is shown in the LED Display - from 0 to 20.*

Once these settings have been made, you can set the rest of the parameters and run the test.

Note: This function affects only the test that is current at the time the Additional Test Samples are set. If you change to another test which requires Additional Test Samples, you must define Additional Test Samples after selecting the new test.

---

11. SELF CHECK / RESET

When this button is pressed, All LED's are cycled on and off, and most internal circuits tested. Any errors will be displayed in the LED Display.

When the analyzer is first switched on, all parameters are set as they were when the unit was turned off. Under certain conditions, the microprocessor circuit may lock. Press the RESET button to fully reset the internal computer to its default conditions.

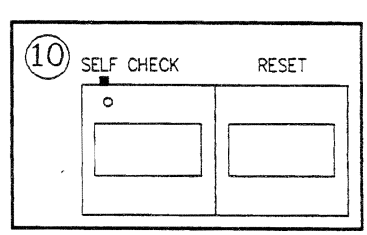

Figure 2-12

The RESET can be used to restore manual control to the 3200B at the completion or abortion of an Autosequence test. You would normally include an FSK panel which would return the analyzer to LOCAL mode, but if the signal line should be disconnected, manual control can be restored by pressing the RESET pushbutton.

RESET may also used to return to manual mode if you are using the RS-232 or IEEE-488 ports to control the instrument, unless you have sent a GPIB buss command to apply LOCAL LOCKOUT.

NOTES:

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July 3, 1990

DIFFERENCES BETWEEN THE 'A' AND 'B' VERSIONS OF THE SOUND TECHNOLOGY 3000 SERIES AUDIO TEST SYSTEMS

The following features are part of the "B" versions of the 3100 Generator and 3200 Analyzer. These features are not available with the "A" versions of both units.

3100B Audio Generator

1) SELECTED FREQUENCY SWEEP

The ability to define the exact frequencies contained in a frequency sweep has been added as a standard feature. The SELECTED FREQUENCY SWEEP function allows you to define and store up to 16 frequency sweep tables, each having up to 98 frequencies, where each frequency can be chosen from an array of 300 total frequencies.

The SELECTED FREQUENCY SWEEP is different from the other 3100B Generator frequency sweep capability (LOG FREQUENCY SWEEP). With the LOG FREQUENCY SWEEP mode, you define the start and stop frequencies of the sweep and the points-per-decade resolution. The 3100B then mathmatically determines those frequencies which will comprise the frequency sweep.

2) LEVEL OFFSET

The ST 3000 series is unique to the world in that you can design and store 32 different test sequences, or proofs, into the Generator. Those proofs are usually stored with a "0dBm/600" operating level. However, in the real world you would probably need to run the proof at a level other than 0dBm. The LEVEL OFFSET capability allows you to quickly and easily offset the level up or down relative to the stored 0dBm operating level.

All you need to do is access the Level LED while you are in the Autosequence (proof) mode. Then key-in a positive or negative level in dB. Once you re-start the proof, each segment the proof will run at relative to the offset level you have chosen!

3100B Generator, continued:

3) STOPPING and then RESTARTING an AUTOSEQUENCE

If you want to stop an Autosequence to printout intermediate results or possibly make an adjustment, you can do it. Simply insert panel no. 255 (a fictitious panel) anywhere in an Autosequence and the proof will stop there. Press START to continue.

4) EXPANDED PROOF MEMORY

The 3100B can store 32 proofs each having up to 50 steps. The generator configurations for each segment of the proofs are stored as "panel setups" and are given a "panel number". There is now generator memory to store up to 300 panel setups. Any of the 300 panel setups can be used throughout any of the 32 proofs.

For reference, the 'A' version of the 3100 Generator has memory sufficient for 16 proofs, each having up to 80 steps. Total panel setup memory is 90 panel setups.

3200B Audio Analyzer

1) GRAPHIC PRINTOUT CAPABILITY

The 3200B can automatically printout test results graphically to a standard dot matrix printer. Contained in the Analyzer memory is 75 different graph formats. The Analyzer looks at the acquired test results and chooses the graph format which will give the best resolution. Graphic printout is an option on the 3200B.

2) WOW AND FLUTTER MEASUREMENT

Wow and Flutter measurement is optionally available on the 3200B Analyzer. You can choose to measure to three different standards: NAB, JIS and DIN/ANSI. All can be measured either weighted or flat. Wow and Flutter can be measured against an incoming carrier frequency between 2.0 and 4.0 kHz. The 3200B's right hand digital display shows the exact carrier frequency.

Wow and Flutter is showed both digitally and on the analog meter. Dynamics are 2-sigma statistically averaged.

The bandwidth of the measured spectra is 0.5 Hz to 300 Hz. Residual Wow and Flutter is less than 0.0005%, NAB flat.

3200B Audio Analyzer continued:

3) SELECTABLE HI/LO INPUT IMPEDANCE

User definable high and low input impedances are standard on the 3200B Analyzer. Generally speaking, the low impedance is usually specified as 600 ohms, while the high impedance is usually 100K ohms each side to ground.

For reference, the 3100A is strictly high impedance on its inputs.

4) OPTIONAL WEIGHTING FILTERS

Front panel selection of an Optional filter has been added. At this time, the only factory available optional filter is CCITT P53/DIN 45405.

5) NOISE FLOOR DISCRIMINATION

Normally, the 3200B will read frequencies down to a one milli-volt level. When making low level signal-to-noise measurements, we can program the Analyzer to read frequencies above a certain user-defined level. This prevents storing data for each random frequency in a random signal. You can now key-in that threshold level on the front panel.

6) DEFINING RESISTANCE FOR WATTS MEASUREMENT

Front panel definition of the resistance for accurate Watts measurement is now available.

For reference, the 3200A only measures Watts into 8 ohms.

7) INCREASED MEMORY FOR STORAGE OF TEST RESULTS

The 3200B now stores up to 99 test catagories for a total of 600 measurement sets, each including up to 3 parameters (i.e. ThD, Frequency and Level).

8) SELECTABLE MEASUREMENT TIME DELAY/ADDING DATA SAMPLES

A measurement "cycle" consists of averaging a number of test samples and storing the results. The settling time requirements of some equipment may require a time delay between the start of the test and the beginning of the

3200B Audio Analyzer, continued:

8) SELECTABLE MEASUREMENT TIME DELAY/ADDING DATA SAMPLES, continued:

measurement cycle. Also, in a particularly noisy environment, it may be desirable to add more test samples to be averaged. Both of these may now be done through FSK, GPIB, or the front panel scroll buttons. A test delay of 0 to 9,999 msec may be added. 0 to 20 data samples may be added with a separate number specified for each of the 9 test categories. Adding data samples also spaces out the time between all samples - future contributing to data smoothing.