New Manual 5/87

MODEL 3100A

SN 101-10202

PROGRAMMABLE AUDIO GENERATOR

option 004

OPERATOR'S MANUAL

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Sine Step/Burst opt 005 895.00
De-emph " 006 495.00
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Sound Technology, Inc.
1400 Dell Avenue
Campbell, CA 95008
U.S.A.
Telephone: (408)378-6540
Telex: 357445

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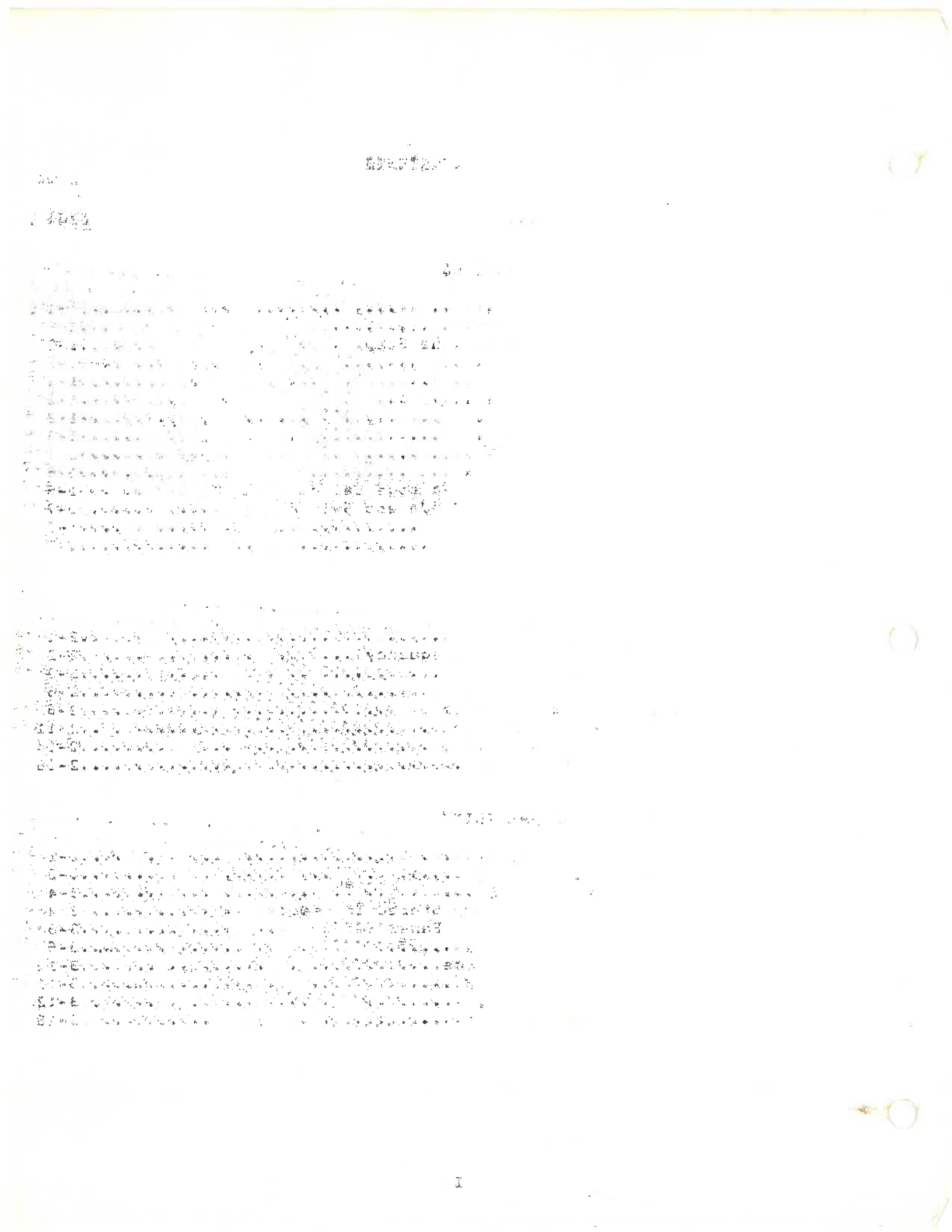

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FOREWORD

The 3100A Generator was designed as an easy-to-use audio generator providing maximum flexibility. The 3100A Generator outputs numerous different waveforms, has extensive front panel memory capabilities, can be operated under remote control, and can be used as a remote controller for the companion 3200A Analyzer. It is highly recommended that the first-time user read this manual and follow the examples to familiarize himself with the extensive capabilities of the 3100A Generator.

This manual is divided into 8 sections. Section 1 provides an overview of the capabilities of the 3100A Generator and an orientation to the front panel design. Section 2 provides detailed examples of usage of the 3100A Generator under manual control. Section 3 explains the front panel programmability features utilizing detailed examples. Section 4 examines the method of using the 3100A Generator as a remote controller for the companion 3200A Analyzer. Section 5 reviews each front panel control button and will be useful as a reference guide during operation. Section 6 explains usage of the 3100A Generator with external controllers via the G.P.I.B. (General Purpose Interface Bus) or the RS-232 bus. Section 7 details the most common usage errors encountered in using the 3100A Generator and the suggested method of rectifying the errors.

It is recommended that the first-time user become thoroughly familiar with Section 2 before proceeding to Sections 3 and 4.

If the operator will be using the 3100A Generator with the Sound Technology 3200A Analyzer we strongly recommend he also read the 3200A Operator's Manual and the Operation's Guide for the 3000 Series Programmable Transmission/Audio Test System.

* * * C A U T I O N * * *

THE 3100A GENERATOR HAS THE CAPABILITY OF OUTPUTTING SIGNALS OF UP TO 30 DBM INTO 600 OHMS WITH BOTH CHANNELS DRIVEN. CHECK THAT YOUR LOAD RESISTANCE OR DEVICE UNDER TEST WILL NOT BE DAMAGED BEFORE OUTPUTTING LEVELS IN EXCESS OF 10 DBM 600.

SECTION 1

OPERATIONAL CHARACTERISTICS

1-1 GENERAL

The 3100A Generator is a programmable audio oscillator with the capability of generating sinewaves, squarewaves, intermodulation distortion test signals, toneburst and sine/step waveforms. The output of the oscillator is two channel, electronically balanced and completely floating.

The 3100A Generator can be operated in a manual mode, or via front panel programmability, or by remote control with an external computer. The manual mode is accessed by operating the buttons on the front panel. The front panel programmability mode is operated by using the front panel controls to store various test sequences into non-volatile memory (no external computer). The 3100A Generator can also be operated under remote control mode via RS-232 bus or G.P.I.B. (General Purpose Interface Bus) by any suitable computer (i.e., I.B.M. P.C., A.T., X.T., Apple II, MacIntosh; H.P. 80 Series; etc.).

The 3100A Generator may be used with the Sound Technology 1510A Tape Recorder/Audio Test System, the Sound Technology 1530A MTS-Stereo Analyzer/Monitor the Sound Technology 3200A Programmable Audio Analyzer, with other analyzers, or as a stand-alone signal source. The 3100A Generator can also be used to operate the Sound Technology Model 3200A Analyzer under remote control via Frequency Shift Keying techniques.

1-2 SPECIFICATIONS

A. SINEWAVE, TONEBURST, SINE/STEP

Frequency Range	10 Hz to 102.39 kHz Frequencies of 1 Hz to 9.9 Hz can be used in Fixed Parameter mode after initial usage of oscillator.
Frequency Resolution	.01% 10 Hz to 102.39 kHz
Frequency Accuracy	.03% FIXED PARAMETERS .1% Automatic Sweep
Frequency Sweep	User selectable 4 to 255 points/decade, internally calculated to provide linear increments on a log-frequency scale; start and stop frequencies selectable over entire range. Sweep direction determined by selection of start and stop frequencies.
Level Sweep	User selected end points in dBm (600 or 150). dB/STEP keyed-in .05 dB to 20.00 dB. Sweep direction determined by selection of start and stop frequencies.

B. SQUAREWAVE

Frequency Range	1 Hz to 50 kHz
Risetime	less than 1 microsecond, controlled by 3-pole linear-phase filter.

C. TONEBURST

Frequency Range	100 Hz to 102.39 kHz
Time On Adjustment	10 milliseconds to 50 minutes
Toneburst Off Adjustment	Burst offtime attenuation from 5 to 60 dB in 5 dB increments

D. SINE/STEP

Frequency Range	100 Hz to 102.39 kHz
Sine On Adjustment	10 milliseconds to 50 minutes
Step On Adjustment	10 milliseconds to 50 minutes

E. SMPTE IMD

IMD Residual Distortion	less than .001%

F. GENERAL

Maximum Output Balanced or Unbalanced (one side grounded)	30.65 dBm/600 ohm load 30.00 dBm/600 ohms, both channels loaded 30.00 dBm/150 ohm load 24.00 dBm/150 ohms, both channels loaded
Maximum Open Circuit Voltage	28.6 V
Minumum Level	-90 dBm (24.5 microVolts)
THD at Maximum Output	less than .001% 10 Hz to 10 kHz less than .0013% to 20 kHz .01% to 100 kHz
Flatness	.1dB 10 Hz to 20 kHz .15 dB to 100 kHz
Level Accuracy	.2 dB at mid-band
Level Resolution	.05 dB
Source Resistance Tolerance	± .5% (-0.35% both channels loaded) with 600 ohms ± 2% (-5.6% both channels loaded) with 150 ohms ± 3% with 50 ohms
Selectable Load Resistance	Key-in 50 ohms to 99,999 kohms
Balance	greater than 120 dB; floating, DC coupled
Separation	greater than 120 dB at 100 kHz
Sync Output	5V positive going squarewave. Follows Lo Freq on IMD and Burst Envelope on Burst or Sine/ Step.
De-Emphasis	75 microseconds, 25 microseconds, 50 micro-seconds, or 10 microseconds. Applies to all functions including IMD
De-Emphasis Accuracy	.02 dB
De-Emphasis Resolution	.05 dB (Attenuator resolution)

1-3 FRONT PANEL FAMILIARIZATION

The front panel of the 3100A can be best understood by dividing the panel into 9 functional areas as shown in Figure 1, page 1-5:

1. PROGRAMMING_GROUP: Allows user to program front panel, recall stored programs, print contents of front panel memory, communicate with 3200A Analyzer via frequency shift keying techniques and access front panel memory security protection. ***PLEASE READ SECTION 3-10 OF THIS MANUAL PRIOR TO INPUTTING GENERATOR ID NUMBER TO AVOID ACCIDENTALLY ACTIVATING PASSWORD PROTECTION***

2. WAVEFORM_GROUP: Allows user to select type of waveform (sinewave, squarewave, SMPTE intermodulation test signal, toneburst and sine/step) to be generated.

3. TEST_MODE_SELECT: Allows user to select either fixed parameter signal, frequency sweep or a level sweep. The auto sequence LED located in this section is only activated via usage of functions within the Programming Section.

4. PARAMETER_GROUP: Allows user to select fixed frequency and level, duration, load resistance, sweep start and stop parameters, dB/step or points/decade for sweeps, separate sweep time multipliers, burst and sine/step configuration.

5. OUTPUT_CONFIGURATION: Allows user to select source resistance, channel(s) to be output, de-emphasis, repeat test and test start and stop.

6. CALIBRATE/RESET: Allows user to periodically recalibrate frequencies to .01% resolution, reset certain functions in front panel memory and recalibrate fixed frequencies stored in front panel memory.

7. KEYPAD: Allows user to input various signal parameters and programming data.

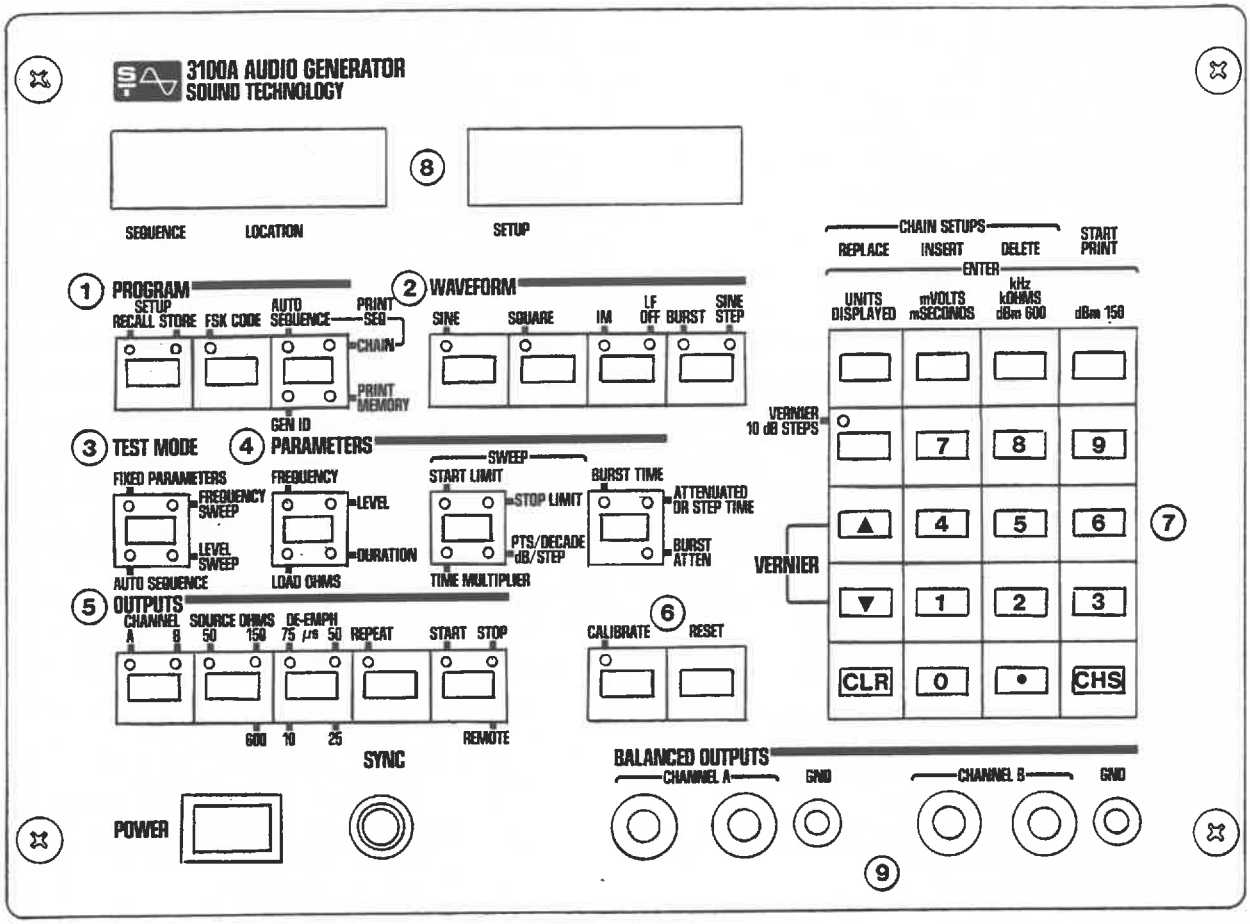


Figure 1. 3200A Generator Front Panel

8. DISPLAY_SECTION: Allows user to review programming input and configuration of signal being output during testing.

9. OUTPUT_CONNECTORS: Two channel balanced outputs, sync connector and power switch.

Figure 1 details the division of the front panel into these functional areas. Please take a few minutes to familiarize yourself with the front panel.

1-4 REAR PANEL CONNECTORS

A. AC,_POWER_INPUT,_FUSE,_VOLTAGE_SELECT_CONNECTOR: This multi-purpose device is located at the upper right side of the rear panel. When the power cord supplied with the 3100A Generator is inserted in the connector a sliding plastic cover will protect the fuse and the voltage changing section of the connector. If the power cord is removed, the plastic cover can be moved to expose the fuse. TO CHANGE THE FUSE OR INPUT VOLTAGE: Lift up on the handle labeled "FUSE PULL" to release the fuse. Insert a new fuse (1.5A, 250V, slo-blo). To change the voltage select PC board: use a small hook or wire to slowly pull out the small PC board located just under the fuse. Note that as the PC board is being removed, one of the voltages etched on the board (100, 120, 220, 240) is visible and "right side up" (the same way as "Fuse Pull"). Turn the PC Board and reinsert it so the operating line voltage is visible in exactly the same manner as when the board was first removed from the connector. When the board is fully inserted, replace the fuse and slide the plastic cover back over the fuse section. Replace the line cord.

B. IEEE-488_CONNECTOR_AND_ADDRESS_SWITCH: This is an optional connector and switch used to connect the 3100A Generator to the General Purpose Interface Bus (GPIB) as defined in the IEEE-488 Standard. Further details are contained in Section 6 of this manual. This port is only installed if the 3100A Generator was purchased with the optional G.P.I.B.

C. PARALLEL_PRINTER_PORT: This is the connector used to connect the 3100A Generator to standard computer printers.

D. RS-232_PORT: This is the connector used to connect the 3100A Generator to the RS-232 bus. Further details are contained in Section 6 of this manual.

SECTION 2

OPERATOR FAMILIARIZATION

2-1 GENERAL

This section of the manual is designed to give a new operator a quick familiarization with the 3100A Generator's operation. The steps should be followed in the order given, as many of them are sequence-dependant. Please note that the LED labels and buttons are in capital letters.

By various keypad operations the 3100A Generator can generate a single fixed parameter signal, a frequency or level sweep, and a sequence of any combination of fixed parameter signals, frequency sweeps and/or level sweeps.

Please note that the 3100A Generator can be purchased in various configurations, dependent upon the options purchased. An instrument purchased without any options will not have De-emphasis, IMD, Toneburst or Sine/Step tests available. The lack of an option will be evident when the appropriate button is pushed and the LED does not light. All of these options may be purchased later and field-installed into your unit. Please contact Sound Technology, Inc. for more information.

The remainder of this Section of the manual details general procedures and detailed examples of outputting various test signals. We recommend that the first-time user read this Section with a 3100A Generator in front of him, connected to a two channel oscilloscope. Connect the A Channel output of the 3100A Generator to the oscilloscope input. The waveforms (especially Toneburst and Sine/Step) are easier to visualize with the usage of the oscilloscope. If both channels A and B are connected to a two channel scope, make sure the ground sides are both connected facing the same direction (either left or right). Both outputs share the same power amplifier,

so grounding the left side of A Channel output and the right side of B Channel output, or vice versa, will short the amplifier output. The amplifier is protected for an indefinite short on its output, but you will lose the signal.

2-2 OUTPUTTING A FIXED PARAMETER FREQUENCY

The 3100A is designed to provide the maximum possible flexibility in configuring the type of signal to be generated by operation of the front panel controls. The recommended procedure for generation of a fixed frequency signal is as follows:

A. Turn Power Switch on.

B. Select Output Configuration (Channel A, Channel B, or Both).

C. Select Source Termination (50 ohms, 150 ohms, or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kohms).

E. Select Fixed Parameter test mode.

F. Select a Waveform (Sine, Square, IM, Burst, or Sine/Step). Additional details on usage of Burst and Sine/Step Waveforms are in Sections 2-5 and 2-6.

G. Select a Frequency (10 Hz to 102.39 kHz for Sine; 100 Hz to 102.39 kHz for Sine/Step or Burst; 10 Hz to 50 kHz for Square; frequencies are predetermined for SMPTE IM). Frequencies of 1 Hz to 9.9 Hz can be used for Sine, Burst or Square after initial operation of oscillator.

H. Select Level (maximum range of .0245 milliVolts to 28.43V; dependant on load and source impedance) and units of measure (V, milliVolts, dBm 150 or dBm 600).

I. Start test.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100A Generator. The example results in the generation of a 1 kHz Sinewave being output on two channels at 0 dBm 600. The source impedance selected is 50 ohms and the load impedance selected is 1000 kohms.

A. Turn Power Switch on.

B. Select the configuration of the Output. Locate the OUTPUTS Group and the CHANNEL Select button. Press the CHANNEL select button until the A LED is lit.

C. Select your Source Termination. Locate the OUTPUTS Group and the SOURCE OHMS Selection button. Press the SOURCE OHMS until the 50 LED is lit.

D. Select your Load Impedance. Locate the PARAMETERS Group and the button with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0", and kHz/kOHMS/ dBm600 keyboard buttons. Notice that "1000.0 kOhm" will be displayed on the right display.

E. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select a Waveform. Locate the SINE LED within the WAVEFORM Group. Press the button and the SINE LED will light.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED. Press the button until the FREQUENCY LED is lit. Go to the keyboard and press the "1" and kHz/kOHMS/dBm 600 buttons in the keyboard. Notice the "1.0000 kHz" will be displayed on the right display. The generator has now been programmed to output a 1 kHz signal.

H. Select the Signal Level. Locate the PARAMETERS Group and the LEVEL LED. Press the button until the LEVEL LED is lit. Go to the keyboard and press the "0" and the kHz/kohms/dBm 600 buttons. Notice that the left display will indicate "0.00 dBm 600." The generator has now been configured to output a 0 dBm 600 signal.

I. Start the Output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate "0.00 dBm 600." Now a continuous signal is being generated until you press the TEST START button again (and the LED registers TEST STOP).

2-3 OUTPUTTING A FREQUENCY SWEEP

The recommended procedure for generation of a frequency sweep is as follows:

A. Turn Power Switch on.

B. Select the Output configuration (Channel A, Channel B, or Channels A and B), Source Impedance (50 ohms, 150 ohms, or 600 ohms) and Load Impedance (50 ohms to 99,999 kOhms).

C. Select Frequency Sweep test mode.

D. Select Level (.0245 milliVolts to 28.43V; dependant on load and source impedance) and unit of measure (milliVolts, V, dBm 150 or dBm 600).

E. Select Starting Frequency (10 Hz to 102.39 kHz) and Stopping Frequency (10 Hz to 102.39 kHz). This determines the direction of the sweep.

F. Select the number of Points-per-Decade (4 to 255).

G. Select the Speed of the sweep (fastest sweep = 1; slowest sweep = 999).

H. Select De-emphasis (none, 75 microseconds, 50 microseconds, 25 microseconds, or 10 microseconds) (De-emphasis is purchased as an option on the 3100A Generator and may not be available on your unit).

I. Select either a Single Sweep or a Repeating Sweep.

J. Start the Sweep.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100A Generator. The example results in the generation of a 10 Hz to 100 kHz frequency sweep with 10 points per decade and 75 microsecond De-emphasis at a 0 dBm 600 level. The sweep will be performed at 1/6 of fastest sweep time available and be output on two channels. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUTS Group and the CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are both lit.

C. Select your Source Termination. Locate the OUTPUTS Group and the SOURCE OHMS Selection button. Press the SOURCE OHMS until the 50 LED is lit.

D. Select your Load Impedance. Locate the PARAMETERS Group and the button with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0", and kHz/kOhms/dBm 600 keyboard buttons. Notice that "1000.0 kOhm" will be displayed on the right display.

E. Locate the TEST MODE button. Press the button until the FREQUENCY SWEEP LED is lit. Please note that the SINE LED will light as SINE is automatically selected. Frequency sweeps are only available with the Sine waveform.

F. Select the Signal Level. Locate the PARAMETERS Group and the LEVEL LED. Press the button until the LEVEL LED is lit. Go to the keyboard and press the "Ø" and the kHz/kOhms/dBm 600 keyboard buttons. Notice that the left display will indicate "Ø.ØØ dBm 6ØØ." The generator has now been programmed to output a Ø dBm 6ØØ signal.

G. Select the starting and stopping frequencies for the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the START LED is lit. Press the "1", "Ø" and the UNITS DISPLAYED buttons on the keyboard. The right display will indicate "1Ø.ØØØ Hz." Press the SWEEP button in the PARAMETERS Group until the STOP LED is lit. Press the "1", "Ø", "Ø" and kHz/kOhms/dBm 6ØØ buttons in the keyboard. The right display will indicate "1ØØ.ØØ kHz." You can sweep from high to low frequency or from low to high frequency.

H. Select the number of points-per-decade. Locate the SWEEP button in the PARAMETERS Group. Press the button until the PTS/DECADE LED is lit. Press the "1", "Ø" and UNITS DISPLAYED buttons on the keyboard. The right display will indicate "1Ø P/D."

I. Select the speed of the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the SWEEP TIME MULTIPLIER is lit. Press the "6" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "6".

J. Select the De-emphasis. Locate the DE-EMPH button in the OUTPUTS Group. Press the button until the 75 microseconds LED is lit. (The De-emphasis function is optional on the 31ØØA Generator. Please check the lower left corner of the rear panel of your unit to locate the option tag. If the tag lists Option ØØ6, your unit includes the De-emphasis function. If your unit does not have the De-emphasis function, skip this step and go on to the next one).

K. Select either a single sweep or a repeating sweep. Locate the button with the REPEAT LED indicator in the OUTPUT Group. Press the button until the REPEAT LED is not lit.

L. Start the output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate what frequency is being output. The left display will indicate the level of the signal. The sweep will take approximately 7 seconds.

The 31ØØA Generator will retain in memory the last fixed parameter frequency setting used. If you use a function which accesses the displays (i.e., LEVEL LED or LOAD OHMS LED) the last fixed frequency used will be indicated on the right display.

The sweep time multiplier will be dependent upon the measurement speed of the analyzer being used with the 3100A. A set of time multiplier guidelines for the 3200A analyzer is contained in Section 3 of the 3200A Analyzer Operations Manual. The operator must also co-ordinate the number of points per decade being generated with the number of points per decade that the anlayzer will be measuring. A detailed discussion of co-ordinating the 3200A analyzer with the 3100A generator is contained in the 3200A Analyzer Operator's Manual.

2-4 OUTPUTTING A LEVEL SWEEP

The recommended procedure for generation of a level sweep is as follows:

A. Turn Power Switch on.

B. Select the Output Configuration (A Channel, B Channel, or A and B Channel), Load Impedance (50 ohms to 99,999 kOhms) and Source Termination (50 ohms, 150 ohms, or 600 ohms).

C. Select Level Sweep mode.

D. Select Frequency (10 Hz to 102.39 kHz) or intermodulation signal waveform (low frequency on or off). Frequencies of 1 Hz to 9.9 Hz can be selected after initial operation of oscillator.

E. Select Starting Level (maximum range of -90 dBm 600 to 30.65 dBm 600, dependant upon load and source impedance) and unit of measure (dBm 150 or dBm 600).

F. Select Stopping Level (maximum range of -90 dBm 600 to 30.65 dBm 600, dependant upon load and source impedance) and unit of measure (dBm 150 or dBm 600).

G. Select the Resolution of sweep (.05 dB/Step to 20 dB/Step).

H. Select the Speed of the sweep (fastest sweep = 1; slowest sweep = 999).

I. Select Single or Repeating sweep. **IMPORTANT** Do not allow the 3100A Generator to continuously output level sweeps for a long period of time. It is possible to leave the 3100A in REPEAT sweep condition and wear out the output attenuator relays. Although the

relay has an estimated life in excess of one million operations, it is possible to perform more than 100 sweeps per minute if the 3100A Generator is allowed to remain in a REPEAT sweep condition.

J. Start the sweep.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100A Generator. The example results in the generation of a repeating -12 dBm 600 to 12 dBm 600 level sweep with 2.00 dB per step at 400 Hz. The sweep will be output at 1/6 of the fastest sweep time available and be output on two channels. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUT Group and CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are lit. Select your Source Termination. Locate the SOURCE OHMS button in the OUTPUTS Group. Press SOURCE OHMS until the 50 LED is lit. Select your Load Impedance. Locate the LOAD OHMS LED in the PARAMETERS Group. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 keyboard buttons. Notice that the "1000.0 kOhms" will be displayed on the right display.

C. Press the TEST MODE button until the LEVEL SWEEP LED is lit.

D. Select the frequency by pressing the button in the PARAMETERS Group until the FREQUENCY LED is lit. Press the "4", "0", "0" and UNITS DISPLAYED buttons on the keyboard (400 Hz). The right display will indicate "400.00 Hz."

E. Select the starting level. Locate the SWEEP button in the PARAMETERS Group. Press the button until the START LED is lit. Press the "1", "2", "CHS" (change signs) and kHz/kOhms/dBm 600 buttons on the keyboard. The left display will indicate "-12.00 dBm 600."

F. Select the stopping level. Press the SWEEP button until the STOP LED is lit. Press "1", "2" and kHz/kOhms/dBm 600 buttons on the keyboard. The left display will indicate "12.00 dBm 600."

G. Select the resolution for the level sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the dB/STEP LED is lit. Press the "2" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "02.00 dB."

H. Select the speed of the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the SWEEP TIME MULTIPLIER LED is lit. Press the "6" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "6."

I. Select either a single sweep or a repeating sweep. Locate the button with the REPEAT LED indicator. Press the button until the REPEAT LED is lit.

J. Start the output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate what frequency is being output. The left display will indicate the level being output. The sweep will take approximately 7 seconds. The sweep will continue until the TEST STOP button is pressed.

The 3100A Generator will retain in memory the last fixed parameter level setting used. If you use a function which accesses the displays (i.e., FREQUENCY LED or LOAD OHMS LED) the last fixed parameter level will be indicated on the left display.

The sweep time multiplier will be dependent upon the measurement speed of the analyzer being used with the 3100A. A set of time multiplier guidelines for the 3200A analyzer is contained in Section 3 of the 3200A Analyzer Operation's Manual. The operator must also co-ordinate the sweep resolution (dB per step) being generated with the sweep resolution that the analyzer will be measuring. A detailed discussion of co-ordinating the 3200A analyzer with the 3100A generator is contained in the 3200A Analyzer Operator's Manual.

2-5 OUTPUTTING A TONEBURST WAVEFORM

The Toneburst waveform is optional on the 3100A Generator. Please check the lower left corner of the rear panel of your unit to locate the option tag. If the option tag lists Option 005, your unit has the capability of Toneburst.

The 3100A Generator allows the user to select frequency, burst time on, burst time off, and burst-off attenuation levels. The different characteristics of the toneburst are as follows:

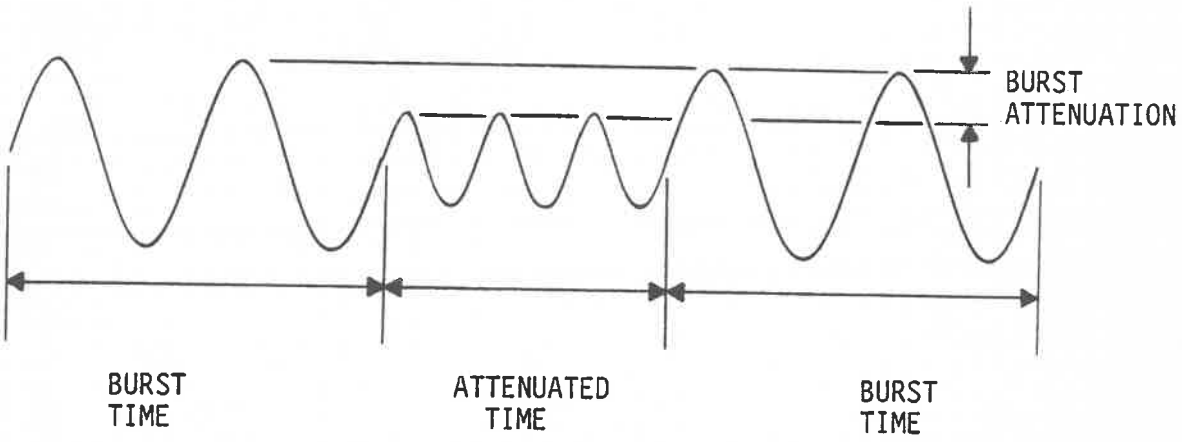


Figure 2. Toneburst Waveform

The recommended procedure for generation of a Toneburst is as follows:

A. Turn Power Switch on.

B. Select Output Configuration (A Channel, B Channel or A and B Channels).

C. Select Source Termination (50 ohms, 150 ohms, or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select the Burst waveform. (Burst is purchased as an option on the 3100A Generator and may not be available on your unit).

G. Select a Frequency (100 Hz to 102.39 kHz).

H. Select a Level (maximum range of .0245 milliVolts to 28.57V dependant on load and source impedance) and unit of measure (V, milliVolts, dBm 150 or dBm 600).

I. Select Burst Time on (10 milliseconds to 50 minutes).

J. Select Burst Time off (10 milliseconds to 50 minutes).

K. Select Burst Attenuation (5 dB to 60 dB in 5 dB increments).

L. Start Test.

To familiarize yourself with these procedures we recommend you input the following example into the 3100A Generator. Following the instructions for this example results in the generation of a series of 40 millisecond 1 kHz Tonebursts followed by 60 millisecond 20 dB attenuated signals. The Toneburst is being output on both channels at a burst level of 2V. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select Output Configuration. Press the CHANNEL select button in the OUTPUTS Group until the A LED and B LED is lit.

C. Select Source Termination. Press the SOURCE OHMS button in the OUTPUTS Group until the 50 LED is lit.

D. Select Load Impedance. Locate the button in the PARAMETERS Group with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 button in the keyboard. Notice the right display will indicate "1000.0 kOhms."

E. Select Fixed Parameter test mode. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select Toneburst waveform. Locate the BURST LED in the WAVEFORM Group. Press button until the BURST LED is lit.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED is lit. Press the "1" and kHz/kOhms/dBm 600 buttons on the keyboard. Notice the right display will indicate "1.0000 kHz."

H. Select the Level. Locate the PARAMETERS Groups and the FREQUENCY LED. Press the button until the LEVEL LED is lit. Press the "2" and UNITS DISPLAYED buttons on the keyboard. Notice the left display will indicate "2.0000V."

I. Select Burst Time on. Locate the BURST TIME LED in the PARAMETERS Group. Press the button until the BURST TIME LED is lit. Press

the "4", "Ø" and the milliVOLTS/mSECONDS buttons on the keyboard. Notice the right display will indicate "Ø.Ø4Ø sec."

J. Select Burst Time off. Press the same button as in I above until the ATTENUATED OR STEP TIME LED is lit. Press the "6", "Ø" and the milliVOLTS/mSECONDS buttons in the keyboard. Notice the right display will indicate "Ø.Ø6Ø sec."

K. Select Burst Attenuation. Press the same button as in J above until the BURST ATTN LED is lit. Press the "2", "Ø" and UNITS DISPLAYED buttons on the keyboard. Notice the left display will indicate "2Ø dB."

L. Start Output of Signal. Press the TEST button in the OUTPUTS Group until the START LED is lit.

2-6 OUTPUTTING A SINE/STEP WAVEFORM

The Sine/Step waveform is optional on the 31ØØA Generator. Please check the lower left corner of the rear panel of your unit to locate the option tag. If the option tag lists Option ØØ5, your unit has the capability of generating Sine/Step signals.

The 31ØØA Generator allows the user to output a sinewave burst followed by a D.C. step signal equal to the peak amplitude of the sinewave. The user selects frequency, duration or sinewave and duration of D.C. step signal. This waveform allows the user to analyze the effects of time delay distortion in steep slope low pass filters. The sinewave burst will accumulate maximum time delay while the D.C. step signal will accumulate minimal time delay. This test signal is used to detect problems resulting from the sinewave coinciding with the beginning of the DC step signal at the filter's output (overshoot). This test signal is also useful as a polarity test within a balanced system.

The different characteristics of the Sine/Step waveform are as follows:

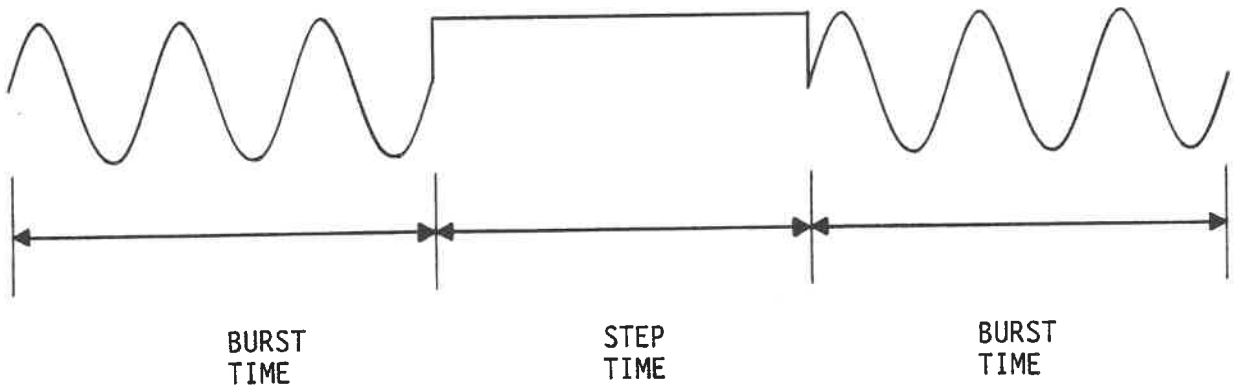


Figure 3. Sine/Step Waveform

The recommended procedure for generation of a Sine/Step waveform is as follows:

A. Turn Power Switch on.

B. Select Output Configuration. (A Channel, B Channel or A and B Channels).

C. Select Source Termination (50 ohms, 150 ohms or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select the Sine/Step waveform.

G. Select a Frequency (100 Hz to 102.39 kHz).

H. Select a Level (maximum range of .0245 milliVolts to 28.57V dependant on load and source impedance) and unit of measure (milliVolts, V, dBm 150 or dBm 600).

I. Select Duration of Sinewave (10 milliseconds to 50 minutes).

J. Select Duration of D.C. step signal (10 milliseconds to 50 minutes).

K. Start Test.

To familiarize yourself with these procedures we recommend you input the following examples into the 3100A Generator. The example results in the generation of a series of 40 millisecond 5 kHz Sinewaves followed by 80 milliseconds D.C. step signals. The Sine/Step is being output on two channels at a 2V level. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select Output Configuration. Press the Channel select button in the OUTPUTS Group until the A LED and B LED is lit.

C. Select Source Termination. Press the SOURCE OHMS button in the OUTPUTS Group until the 50 LED is lit.

D. Select Load Impedance. Locate the button in the PARAMETERS Group with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 button on the keyboard. Notice the right display will indicate "1000.0 kOhms."

E. Select Fixed Parameter test mode. Locate the TEST MODE button. Press the button until the SINE STEP LED is lit.

F. Select Sine/Step waveform. Locate the SINE STEP LED in the WAVE-FORM Group. Press button until the SINE STEP LED is lit.

G. Select the Frequency. Locate the PARAMETERS Group and the FRE-QUENCY LED. Press the button until the FREQUENCY LED is lit. Press the "1" and "kHz" buttons on the keyboard. Notice the right display will indicate "1.0000 kHz."

H. Select the Level. Press the same button in the PARAMETERS Group as in G above until the LEVEL LED is lit. Press the "2" and UNITS DISPLAYED buttons in the keyboard. Notice the left display will indicate "2.0000V."

I. Select Duration of Sinewave. Locate the BURST TIME LED in the PARAMETERS Group. Press the button until the BURST TIME LED is lit. Press the "4", "0", and milliVOLTS/milliSECONDS buttons on the keyboard. Notice the right display will indicate "0.040 sec."

J. Select Duration of D.C. offset. Press the same button as in I above until the STEP TIME LED is lit. Press the "8", "Ø", and milliVOLTS/milliSECONDS buttons on the keyboard. Notice the right display will indicate "Ø.Ø8Ø sec."

K. Start Output of Signal. Press the TEST button in the OUTPUTS Group until the START LED is lit.

2-7 USE OF VERNIER

The 31ØØA Generator has the capability of adjusting an entered frequency or level parameter by using a built in vernier. Located in the keyboard section there is a button with a VERNIER/1ØdB STEPS LED. When this LED is NOT lit, the user may adjust the previously entered frequency or level either up or down by pressing one of the two VERNIER buttons in the keyboard. The usage of the VERNIER button eliminates the need to enter a new frequency or level on the keyboard.

The vernier allows the user to adjust the frequency of sinewaves and squarewaves. The frequency vernier can be accessed whenever the 31ØØA Generator is in FIXED PARAMETER or LEVEL SWEEP mode and the FREQUENCY LED is lit. To operate the vernier, press either of the VERNIER buttons in the keyboard. The changes in frequency are indicated in the right display. The level vernier can be used with any waveform. The level vernier can be accessed whenever the 31ØØA Generator is in FIXED PARAMETER or FREQUENCY SWEEP test mode and the LEVEL LED is lit. To operate the vernier, press either of the VERNIER buttons in the keyboard. The changes in level are indicated in the left display.

2-8 USE OF 10dB STEP FUNCTION

The 3100A has the capability of automatically adjusting the previously entered level by 10dB increments by pressing a button. The 3100A Generator will automatically adjust the level settings in any unit of measure. The 3100A Generator will accept level settings in Volts, milliVolts, dBm 150 or dBm 600. The 10dB STEP function can be used with any waveform. The 10dB STEP function can be accessed whenever the 3100A Generator is in FIXED PARAMETER or FREQUENCY SWEEP test mode and the LEVEL LED is lit. Within the keyboard section of the 3100A Generator there is a button with a VERNIER/ 10dB STEP LED. When the LED is lit, the 10dB STEP function is available. When the LED is not lit, the VERNIER function is available. To operate the 10dB STEP function, press either of the VERNIER buttons in the keyboard. The change in level will be indicated in the left display.

SECTION 3

FRONT PANEL PROGRAMMABILITY

3-1 GENERAL

The 3100A Generator may be programmed by using the built-in memory and front panel controls. No external computer or controller is needed, the only necessary component is the 3100A Generator. The programming requires no prior knowledge of programming or software languages. With a few keyboard entries, up to 80 fixed parameter waveforms, frequency sweeps, or level sweeps, can be stored into memory. Any of these memory positions can then be linked together into as many as 16 auto-sequence chains, each chain consisting of up to 80 fixed parameters and/or sweeps.

The front panel programmability accesses all of the capabilities of the 3100A Generator. Any signals that can be generated by using the front panel controls may also be stored and used as a preprogrammed signal. With the exception of toneburst and Sine/Step waveforms, any of the preprogrammed signals can then be linked into auto-sequences. (If the Toneburst Sine/Step waveforms are included in an auto-sequence, the 3100A Generator will skip the waveform and continue the auto-sequence). The linked signals are assigned a two-digit code and recalled by entry of this code. For example, a sequence of a combination of up to 80 frequency sweeps, level sweeps, fixed frequency or fixed level signals can be run by entering the assigned two-digit code and pressing START TEST. The user can stipulate all of the normal parameters (i.e., frequency, level, sweep start and stop limits, output configuration, points-per-decade, signal duration, etc.) for each of the 80 front panel set-ups. The operator has the ability to devise and run elaborate test procedures with minimal entry.

3-2 STORING A FRONT PANEL SET-UP

The procedure for storing a front panel set-up involves setting-up the Generator front panel for the desired signal exactly as you would do in the manual mode (see Section 2 of this manual), inputting an operation code, assigning a memory location number (1 through 80), and storing the panel set-up.

The operation code is a ten-digit number utilized for remote control of the Sound Technology Model 3200A Audio Analyzer. For the sake of simplicity we will be using the two keystroke entry of "00000", "10000" since in our example the 3100A Generator is not communicating with the 3200A Analyzer. The control of the 3200A Analyzer is accomplished via a series of coded frequency bursts transmitted through the audio path being tested. This technique is referred to as frequency shift keying, or "FSK."

The operation code allows the user of the 3100A Generator to determine which type of measurement will be made by the 3200A Analyzer, which filters to be used, detection method, units of measure, print function, and input configuration. If the 3100A Generator is not being used with the 3200A Analyzer, entry of the operation code "0000010000" is still necessary.

Assuming the 3100A Generator is being used without utilizing remote control of the 3200A Analyzer, the method of storing a frequency sweep would be as follows:

A. Set-up the front panel buttons as you would to output a frequency sweep. Follow the instructions in paragraph 2-3, pertaining to the detailed example, step A through L.

B. Press the TEST MODE button until the FREQUENCY SWEEP LED is lit.

C. Press the button in the PROGRAM Group until the FSK LED is lit.

D. Press the "0" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "00000." Press the "1" and UNITS DISPLAYED buttons in the keyboard. The right display will indicate "10000." The operation code "0000010000" is now associated with this front panel set-up.

E. Locate the PROGRAM SET-UP button in the PROGRAM Group. Press the button until the STORE LED is lit.

F. Press the "1" button and UNITS DISPLAYED in the keyboard. The left display will indicate "1". The frequency sweep is now stored in memory position 1.

For a detailed explanation of the usage of operation codes for remote control of the 3200A Analyzer, please refer to Section 4 of this manual. The same procedure is followed for storing a fixed parameter signal except that the duration of the signal must also be specified. Setting the duration does not apply to normal manual operation of the 3100A Generator. During manual use, a fixed signal is constantly output until the STOP button is pressed. It is necessary to define duration of the signal since the front panel set-up may be used in an auto-sequence of front panel set-ups. The procedure for storing a fixed parameter front panel set-up is to set up the Generator front panel for the desired signal exactly as you would in the manual mode (see paragraphs 2-2, 2-5 and 2-6), selecting duration time (5 milliseconds to 50 minutes), inputting an operation code, assigning a memory location number (1 through 80), and storing the front panel set-up. It is very important that adequate time duration is provided to allow the analyzer to measure the signal. A guide to time durations for various signals for the 3200A analyzer is located in Section 3 of the "3000 Series Operation Guide". For example, to store a fixed parameter signal, follow the instructions in the example in paragraph 2-2, up to step I. Then:

A. Locate the DURATION LED in the PARAMETERS Group. Press the button until the DURATION LED is lit. Press the "1", "0", "0", "0" and UNITS DISPLAYED buttons in the keyboard. Notice the right display indicates "1.000 sec."

B. Press the button in the PROGRAM Group until the FSK LED is lit.

C. Press the "0" and UNITS DISPLAYED buttons in the keyboard. The left display will indicate "00000". Press the "1" and UNITS DISPLAYED buttons in the keyboard. The right display will indicate "10000." The operation code "0000010000" is now associated with this front panel set-up.

D. Locate the PROGRAM SETUP button in the PROGRAM Group. Press the button until the STORE LED is lit.

E. Press the "2" and UNITS DISPLAYED buttons in the keyboard. The left display will indicate "2". Now this fixed parameter signal is stored in memory position 2.

The same procedure can be followed to store up to 80 different front panel set-ups.

3-3 RUNNING A FRONT PANEL SET-UP

The procedure for running one of the previously stored front panel set-ups is to recall the set-up and start the signal. All stored front panel set-ups can be reviewed by viewing the LEDs and displays on the front panel or by printing the panel set-ups via a standard computer printer (see Section 3-7). For example, to review and run the front panel set-ups you have stored in paragraph E of Section 3-2 above:

A. Locate the PROGRAM SETUP button in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "1" button and UNITS DISPLAYED on the keyboard. The front panel will have the same LED's lit as when you input the original front panel set-up. By reviewing the lit LED's and the two displays you have the complete configuration of the stored panel set-up in the number 1 memory position. Press the "2" button and UNITS DISPLAYED on the keyboard. The front panel will have the same LED's lit as when you input the original front panel set-up number 2. By reviewing the lit LED's and the two displays, you have the complete configuration of the stored panel set-up in number 2 memory position. You may display the load impedance in the stored panel by pressing the LOAD OHMS button in the PARAMETERS Group which displays the load impedance in the right display.

If you try to RECALL a front panel set-up which is not in memory, the left display will indicate "- - -."

C. To start the signal, press the START button in the OUTPUTS Group until the START LED is lit. Whatever front panel set-up which has been recalled from memory will define the signal generated.

3-4 MODIFYING A FRONT PANEL SET-UP STORED IN MEMORY

The procedure for modifying a front panel set-up currently in memory

involves recalling the front panel set-up, inputting the desired revision, and storing the revised front panel set-up. It is essential that the front panel set-up is stored after revision or the revision will be ignored by the 3100A Generator.

Assuming you wish to modify the front panel set-up in memory position 4 to output a SQUARE waveform instead of a SINE waveform, the procedure would be as follows:

A. Locate the SETUP RECALL LED in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "4" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate the level and frequency of the signal of front panel set-up number 4. The LED's will indicate the other characteristics of the signal stored in front panel set-up number 4.

C. Press the appropriate buttons to revise the signal as desired. In this example, press the SQUARE button in the WAVEFORM Group. D. Locate the SETUP STORE LED in the PROGRAM Group. Press the button until the STORE LED is lit.

E. Press the "4" and UNITS DISPLAYED buttons in the keyboard. The revised front panel set-up is now stored in front panel set-up number 4 memory.

3-5 REPLACING OR DELETING A FRONT PANEL SET-UP

After storing a front panel set-up in memory the front panel set-up can be replaced by inputting a new front panel set-up into the same memory position. The procedure for replacing a front panel set-up is the same as the Arocedure to store a new front panel set-up.

To delete a front panel set-up from memory, the procedure is to recall the front panel set-up, change the operation code to "0000000000", and store the front panel set-up.

Assuming you wish to delete front panel set-up number 26, the procedure would be as follows:

A. Locate the SETUP RECALL LED in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "2", "6" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate the level and frequency of the signal of front panel set-up number 26. The LED's will indicate the other

characteristics of the signal stored in front panel set-up number 26.

C. Press the FSK CODE button in the PROGRAM Group until the LED is lit.

D. PRESS THE "Ø", UNITS DISPLAYED, "Ø" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate "ØØØØØ" and "ØØØØØ".

E. Locate the SETUP STORE LED in the PROGRAM Group. Press the button until the STORE LED is lit.

F. Press the "2", "6" and UNITS DISPLAYED buttons in the keyboard.

3-6 STORING AN AUTOMATED SEQUENCE

There are 16 memory locations available for storing auto-sequences of front panel set-ups. The front panel set-ups can be linked together in any sequence and a front panel set-up can be used multiple times in a auto-sequence. A front panel set-up can also be used in different auto-sequences. The 16 memory locations for auto-sequences are assigned the code numbers 1 through 16. The load resistance selected in the first front panel set-up encountered in the auto-sequence will be used in the entire remaining auto-sequence. In auto-sequences in memory positions 9 through 16, the level selected in the first front panel set-up encountered in the auto-sequence will be used in the entire remaining auto-sequence. These two automatic features allow the user to design extensive test sequences of a combination of up to 8Ø sweeps and/or fixed parameter signals which can be used at any desired load resistance or level. To change level or load resistance, the user can simply change level or load resistance in the first panel set-up of the auto-sequence. **IMPORTANT** If the auto-sequence is started at a point other than location one, the load impedance contained within the first front panel set-up encountered will determine load impedance for the remainder of the auto-sequence. If the auto-sequence numbers 9 through 16 are started at a point other than location one, the fixed parameter level setting contained within the first front panel set-up

encountered will determine level setting for the remainder of the auto-sequence.

Another useful feature is available to suppress the transmission of FSK codes during an auto-sequence. As the 3100A Generator can be used with analyzers which do not have FSK capability, it may be desirable to eliminate the generation of frequency bursts used for FSK communication. By changing the first digit in the operation code to "0" in the first front panel set-up encountered while running an auto-sequence, no FSK codes will be transmitted by any front panel set-ups within the remaining auto-sequence.

While in the auto-sequence mode, the two displays of the 3100A Generator are divided into three, two-digit groups. To assist you in visualizing this, please locate the button in the PROGRAM Group with the AUTO SEQUENCE LED. Press the button until the AUTO SEQUENCE LED is lit. Please note that the AUTO SEQUENCE LED on the TEST MODE button automatically lights up and the two displays have three sets of two-digit numbers. The first two digits in the left display is the auto-sequence number (1 through 16) you are working with. The second two digits in the left display is the location within the auto-sequence (1 through 80) that you are working with. The two digits in the right display is the front panel set-up (1 through 80) that you are working with. Assuming the display readout is 04 02 08 you know that front panel set-up number 8 is the second test signal to be generated in auto-sequence number 4.

Although front panel set-ups using squarewave, toneburst and sine/step waveforms can be stored, the front panel set-ups cannot be accessed through auto-sequences. If a front panel set-up utilizing one of these waveforms is included within an auto-sequence, the 3100A Generator will ignore this front panel set-up and continue to the next chained front panel set-up.

Front panel set-ups may be stored using repeating frequency and level

weeps. When a repeating sweep is encountered within an auto-sequence, the weep will be performed one time. If the user desires repeating sweeps he ay enter the desired front panel set-up numerous times within the auto- equence.

The procedure to store an auto-sequence is to put the 3100A Generator nto the auto-sequence mode, locate the desired auto-sequence number, put he 3100A Generator into chain sequence, and enter the front panel set-up umber in whatever order the operator desires.

To facilitate ease of entry and editing, the 3100A Generator uses the top row of buttons in the keyboard for various editing capabilities during the creation of auto-sequences or the editing of existing auto-sequences. Please note the buttons marked "REPLACE", "INSERT", and "DELETE" under the "CHAIN SETUPS" title.

An effective illustration of these procedures first requires that numerous front panel set-ups are stored in memory. We recommend you either have several front panel set-ups stored in memory or you store the following front panel set-ups into memory:

Front Panel Set-Up No.	Description	Analysis
1	1 kHz, +4 dBm/600 A&B channel, 10 sec	set ref. level
2	10 khz, -16 dBm, A&B channel, 5 sec	phase error
3	15 kHz, -16 dBm, A&B channel, 5 sec	phase error
4	freq sweep, 20kHz-10Hz, 4pts/dec, A chan	channel sep
5	freq sweep, 20kHz-10Hz, 10pts/dec, 4x speed	frequency response
6	freq sweep, 20kHz-10Hz, 5pts/dec, 35x speed	freq vs dist (THD)
7	SMPTE IMD	IMD distortion
8	A&B channel terminated, 10 sec	signal/noise
9	freq sweep, 50usec de-emphasis	freq resp, STL
10	1kHz, +4 dBm/600 A&B channel, 10 sec	final level check

Assuming you want the auto-sequence to generate the above front panel set-ups in the following order: 1, 4, 5, 6, 2, 3, 7, 9, 8, 10, the procedure to create the auto-sequence is:

A. Locate the AUTO SEQUENCE LED in the PROGRAM Group. Press the

button until the AUTO SEQUENCE LED is lit. Note that the displays will show three, two-digit numbers.

B. Press the "1" and UNITS DISPLAYED buttons on the keyboard. The first two-digit group in the left display will be "Ø1" indicating that you are working with auto-sequence number one.

C. Locate the CHAIN LED in the PROGRAM Group. Press the button until the CHAIN LED is lit.

D. Press the "up" VERNIER button once. The second two-digit group in the left display will indicate the location number you are working with within the auto-sequence. Pressing the "up" VERNIER advances the location within the auto-sequence by one position and pressing the "down" VERNIER decreases the location within the auto-sequence by one position. use the VERNIER function until the display indicates that the second two-digit group is "Ø1."

E. Press the "1" and UNITS DISPLAYED button in the keyboard. The right display will be "Ø1" indicating that you are storing front panel set-up number 1 as the first signal to be generated in auto-sequence number 1. The displays will indicate "Ø1 Ø1 Ø1".

F. The first front panel set-up encountered in the auto-sequence will define the load impedance through out the entire remaining auto-sequence. In auto-sequences 9 through 16, the level setting in the first front panel set-up encountered in the auto-sequence will define the level of the signals throughout the entire remaining auto-sequence.

Since all stored front panel set-ups have a fixed level associated with them, even level sweeps and "pure op code panels, we recommend that the initial front panel set-up in auto-sequences 9 through 16 be used to establish the correct level for the remainder of the auto-sequence. The fixed level associated with a level sweep or "pure op code" is the last fixed parameter level used in the 3100A Generator prior to the level sweep or "pure op code" being stored in front panel memory.

G. Press the "up" VERNIER button once. The second two-digit group in the left display will be "Ø2" indicating that you are working with the second location within the auto-sequence.

H. Press the "4" and UNITS DISPLAYED button in the keyboard. The right display will be "Ø4" indicating that you are storing front panel set-up number 4. The three two-digit groups shown on the displays, 01 02 04, indicates that front panel set-up 4 will be the second test signal to be generated in auto-sequence number 1.

I. Continue steps G & H for the remaining front panel set-ups that are to be included in auto-sequence number 1. Please note that there are 80 available locations in each auto-sequence.

J. If you wish to suppress the transmission of frequency bursts used in FSK communication, the first digit of the operation code in the first front panel set-up encountered when running the auto-sequence should be changed to "Ø". This will result in the suppression of all FSK signals during the entire remaining auto-sequence. It is necessary to retain one non-zero digit in the operation code to prevent deletion of the front panel set-up from memory. The suppression of FSK communication is highly recommended if the 3100A Generator is being used with an analyzer other than the 3200A Analyzer. The procedure to follow is to put the 3100A Generator into FIXED PARAMETER TEST MODE, press SETUP RECALL in PROGRAM Group, enter on the keyboard the front panel set-up number which is in the first location encountered when running your auto-sequence, press the FSK CODE button until the LED is lit, and enter on the keyboard the operation code "00000100000".

Press the SETUP STORE in PROGRAM Group followed by keyboard entry of desired front panel set-up number and UNITS DISPLAYED button. You have changed the FSK code and stored the change into memory. It is only necessary to change the first digit of the operation code to zero for suppression of FSK code transmission. Obviously, if the existing FSK code has a leading zero, no change is necessary to suppress FSK code transmission.

K. To determine if the front panel set-ups have been stored properly, press the "down" VERNIER button until the displays indicate **Ø1 Ø1 Ø1**. By pressing the "up" VERNIER button you can review the auto-sequence of front panel set-ups. If the front panel set-ups have been stored correctly, the displays should be as follows:

Ø1 Ø1 Ø1
Ø1 Ø2 Ø4
Ø1 Ø3 Ø5
Ø1 Ø4 Ø6
Ø1 Ø5 Ø2
Ø1 Ø6 Ø3
Ø1 Ø7 Ø7
Ø1 Ø8 Ø9
Ø1 Ø9 Ø8
Ø1 Ø1 Ø1

The auto-sequences can be edited by usage of the UNITS DISPLAYED, INSERT, and DELETE keys in the keyboard.These keys are only functional when the CHAIN LED is lit. The REPLACE key will remove an existing front panel set-up from the auto-sequence and substitute whatever front panel set-up number that is then entered in the keyboard followed by pressing REPLACE. The INSERT key will allow the inserting of a front panel set-up between two existing location numbers by entering the desired front panel set-up number on the keyboard followed by pressing INSERT. The DELETE key will allow removal of a front panel set-up by pressing the DELETE key when the appropriate front panel set-up or location number is indicated on the display.

3-7 REVIEWING AN AUTOMATED SEQUENCE

The procedure for reviewing one of the previously stored auto-sequences, is to recall the auto-sequence and scroll through the memory locations in the auto-sequence. The auto-sequence can be reviewed on the displays or by printing the auto-sequence via a standard computer printer (see Section 3-9). For example, to review an auto-sequence you have stored in memory position 1:

A. Locate the AUTO SEQUENCE LED in PROGRAM Group. Press the button until the AUTO SEQUENCE LED is lit.

B. Press the "1" and REPLACE buttons in the keyboard. The first two-digit group in the left display will be "Ø1", indicating you are working with auto-sequence in memory position 1.

C. Locate the CHAIN LED in the PROGRAM Group. Press the button until the CHAIN LED is lit.

D. The displays will show three two-digit groups, such as **Ø1 Ø8 Ø9**, indicating that front panel set-up number 9 will be the 8th test signal to be generated in auto-sequence 1. To review the sequencing of the front panel set-ups within the auto-sequence number one, use the "down" VERNIER to scroll to location one in the auto-sequence. Please note that there are 8Ø available locations in each auto-sequence.

As discussed in Section 3-4, the 31ØØA Generator has REPLACE, INSERT, and DELETE editing functions available to facilitate revisions to auto-sequences.

3-8 RUNNING AN AUTOMATED SEQUENCE

The procedure for running an auto-sequence is to put the 31ØØA Generator into auto-sequence mode, recall the auto-sequence desired, and start the test. For example, to run auto-sequence number 1:

A. Locate the AUTO SEQUENCE LED in the PROGRAM Group. Press the button until the AUTO SEQUENCE LED is lit. Note that the displays will show three two-digit numbers. If the first two-digit group is the correct auto-sequence you wish to run, step B is not necessary. If the first two-digit group is the correct auto-sequence, and the

second two-digit group is the correct location for starting the auto-sequence, steps B and C are not necessary.

B. Press the "1" and REPLACE buttons in the keyboard. The first two-digit group in the left display will be "Ø1", indicating you have recalled auto-sequence number 1 from memory.

C. Review the second two-digit group in the left display. Whatever two-digit location is indicated will be the beginning location for signal generation in the auto-sequence. You can start an auto-sequence from any location within the sequence. If the location number in the display is not the desired beginning location of the auto-sequence, then the VERNIER buttons can be used to scroll the location number to the desired beginning location.

D. Press the START button in the OUTPUTS Group. The auto-sequence will stop when it encounters location number "ØØ" or a front panel set-up numbered "ØØ".

The user can limit the length of an auto-sequence by inserting a front panel set-up numbered "ØØ" within the auto-sequence. This may be desirable if the user has an extensive test procedure in memory but may only wish to use a portion of the procedure at this point in time. For example, the user may have an auto-sequence of 7Ø front panel set-ups but currently only wants to run the front panel set-ups in locations 17 through 42. The auto-sequence should be edited by inserting a front panel set-up of "ØØ" into location 43. The user can then scroll the auto-sequence so that the beginning of test signals are at location 17. We recommend that the front panel set-up at location 17 be used as a reference panel with the correct load impedance and, if in auto-sequence number 9 through 16, that panel 17 have the desired level for the entire auto-sequence. The test signals will automatically end when the "ØØ" front panel set-up is encountered at location 43. The front panel set-up "ØØ" in location 43 can be removed later by usage of the DELETE function.

3-9 PRINTING MEMORY

The 31ØØA Generator has a parallel printer port located on the rear panel. You can attach a parallel printer, such as Epson, Brother, Okidata,

or Canon, to the 3100A Generator and print out the information contained in memory. The procedure for obtaining a print-out of memory is:

A. Locate the PRINT MEMORY LED in the PROGRAM Group. Press the button until the PRINT MEMORY LED is lit.

B. Press the START PRINT button in the top row of the keyboard.

The 3100A Generator will print two different reports listing the memory contents. The first report will provide a numerical listing of stored front panel set-ups (Figure 4). The second report provides a chart of the front panel set-ups contained in each auto-sequence listed in the location order within the auto-sequence (Figure 5). A chart is printed for each auto-sequence stored in memory.

A print-out of the front panel set-ups (as shown in Figure 6) contained within one specific auto-sequence can be obtained by the following procedure:

A. The CHAIN LED in the PROGRAM Group should be lit.

B. Use the VERNIER function to scroll the display to the location number where you wish the print-out to begin. You may start the print-out at any point within an auto-sequence.

C. Press the START PRINT button in the top row of the keyboard.

GENERATOR ID :

ST 3100A STORED PANEL SETUPS

PANEL No. 1

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 2.500 Sec Dur

A&B-CH ON RS = 50 ohms RL = 600.00 ohms DE-EMPH : Off
OP-CODE 0 1 1 0 0 0 0 0 0 0

PANEL No. 20

FIXED PARAMETERS SINE 0.00 dBm-600 11.800 kHz 1.000 Sec Dur

A&B-CH ON RS = 50 ohms RL = 100.00 Kohms DE-EMPH : Off
OP-CODE 5 6 0 0 0 0 0 0 0 0

PANEL No. 21

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 4.000 Sec Dur

A-CH ON RS = 50 ohms RL = 100.00 Kohms DE-EMPH : Off
OP-CODE 1 0 1 0 0 4 1 2 0 1

PANEL No. 22

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 4.000 Sec Dur

A&B-CH TERM RS = 50 ohms RL = 100.00 Kohms DE-EMPH : Off
OP-CODE 2 2 1 1 4 1 2 0 0 0

PANEL No. 23

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 3.000 Sec Dur

A&B-CH TERM RS = 50 ohms RL = 600.00 ohms DE-EMPH : Off
OP-CODE 6 2 0 0 0 0 0 4 0 0

Figure 4. Stored Front Panel Set-ups

ST 3100A STORED CHAIN TESTS

AUTO-SEQUENCE No. 2 Current Start Location 1

20	21	22	23	37	28	33	26	27	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1

AUTO-SEQUENCE No. 6 Current Start Location 1

20	21	22	23	30	25	28	26	27	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0

Figure 5. Stored Auto-Sequences

```
GENERATOR ID :

                ST 3100A AUTO-SEQUENCE No. 6

PANEL No.  20

OP-CODE   5 6 0 0 0 0 0 0 0 0              0.00 dBm-600


PANEL No.  21

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz   4.000 Sec Dur

A-CH ON        RS = 50 ohms     RL = 100.00  Kohms DE-EMPH : Off
OP-CODE   1 0 1 0 0 4 1 2 0 1


PANEL No.  22

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz   4.000 Sec Dur

A&B-CH TERM    RS = 50 ohms     RL = 100.00  Kohms DE-EMPH : Off
OP-CODE   2 2 1 1 4 1 2 0 0 0


PANEL No.  23

OP-CODE   6 2 0 0 0 0 0 4 0 0              0.00 dBm-600


PANEL No.  30

FREQUENCY SWEEP     SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec     40 = TIME MULT
A-CH ON        RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
OP-CODE   3 2 1 4 5 4 2 0 0 0


PANEL No.  25

FREQUENCY SWEEP     SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec     60 = TIME MULT
A-CH ON        RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
OP-CODE   3 5 1 1 4 4 1 0 1 0
```

Figure 6. Current Auto-Sequence

```
PANEL No.  28

FREQUENCY SWEEP     SINE              0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec     35 = TIME MULT
A&B-CH ON       RS = 50 ohms       RL = 600.00 ohms    DE-EMPH : Off
OP-CODE    3 6 3 0 0 0 0 0 0 0


PANEL No.  26

OP-CODE    5 3 0 0 0 0 0 0 0 0                    0.00 dBm-600


PANEL No.  27

OP-CODE    5 1 0 0 0 0 0 0 0 0                    0.00 dBm-600
```

Figure 6. Current Auto-Sequence (cont.)

If the print function is not operating correctly please refer to Appendix I of this manual for the printer port pin configuration of the 3100A. Although the pin configuration on the parallel port of the 3100A is the conventional configuration it is possible that a printer's pin configuration may differ. Review the pin configuration within your printer's operations manual for conformity with the 3100A pinout configuration.

3-10 PASSCODE PROTECTION OF MEMORY

The 3100A Generator has a passcode security system feature allowing protection of front panel memory. Without the correct passcode, front panel set-ups and auto sequences cannot be modified or created. The passcode is established and modified by accessing the GEN ID LED in the Programming Section of the front panel. When the 3100A Generator is shipped, the identification number is blank.

The 3100A can be operated without ever accessing the passcode protection feature. To avoid creation of passcodes never enter a passcode with a preceeding minus sign. Any generator identification number without a preceding minus sign can be used and passcode protection will not be activated. If you want to use the passcode protection access the generator identification number by lighting the GEN ID LED. Enter any 4-digit identification number with a preceding minus (-) sign and you have specified the 4-digit identification number as a security passcode. After completing or modifying the front panel memory you can secure this information by inputting a different generator identification number. Entering a different generator identification number is necessary as the 3100A Generator will retain the original passcode generator identification number in non-volatile memory until this identification number is changed. If the passcode generator identification number is not residing in memory, the SETUP STORE and CHAIN LED's on the front panel are not accessible. When in this configuration the front panel set-ups and automated sequences cannot be modified.

To regain access to the front panel memory, input the 4-digit passcode generator identification number with the preceding digit being the number "0". This entry will remove the passcode security. Passcode security can

be re-established by entering any 4-digit identification number with a preceding minus sign. The last 4-digit identification number preceded by a minus sign will be the current passcode.

It is essential that generator identification numbers do not use a preceding minus sign unless the passcode security system is being activated. As in the case of any passcode, it is important that the passcode be retained in a safe place. If you lose the passcode it may be necessary to return the 3100A Generator to the factory to remove the passcode protection.

SECTION 4

FREQUENCY SHIFT KEYING

4-1 GENERAL

The 3100A Generator has the ability to operate the 3200A Analyzer under remote control. This control is accomplished via a series of coded frequency bursts transmitted through the audio path being tested. This technique is referred to as frequency shift keying or "FSK".

The 3100A Generator uses a ten-digit operation code linked to each front panel set-up stored in the 3100A Generator to control the 3200A Analyzer. The operation code allows the user to determine which type of measurement will be made, filter configuration, detection method, units of measurement, input configuration, and control over print functions of the 3200A Analyzer.

The codes used to control the 3200A Analyzer are listed in Figure 7. The first digit defines the generic use of the panel's information (op code only, noise test, frequency or level sweep, etc). The second digit defines the measurement to be performed (level, ratio, IMD, phase, etc.). The third digit defines the channel to be used. The fourth digit defines the high pass filter to be used. The fifth digit describes the low pass filter. This completes the five digits on the 'A' display (the left hand LED display). On the 'B' display, the sixth digit describes weighting filters to be used. The seventh digit describes detection circuits. The eighth, level units and the ninth, THD units. The tenth and last panel is used to describe miscellaneous functions such as Autoranging and setting reference level.

4-2 HOW TO INSERT AN OP CODE

Usually, designing and inserting an op code is the last step before storing a panel into memory. It is also quite common to modify an op code in a panel after it has already been stored.

A. Determine what measurements you intend to perform. After determining what measurement is desired, you can design the appropriate generator panel op code. Since the op code is part of the generator panel, it is necessary to know what measurement will be performed with each stored generator panel. Assuming you want to set a reference off of a 1 kHz, 0 dBm/600 signal, the following procedure would apply:

B. Design and load the appropriate generator panel to give the analyzer the frequency(s) and level(s) necessary to perform the function described in A above. In this instance a Fixed Parameter panel having a frequency of 1 kHz and a level of 0dBm/600 with a time duration of 2000 msec should suffice. Key in all of the applicable numbers and functions (channel select, etc) for this panel.

C. Referring to figure seven, the appropriate op code for our purposes would be: 10100-41201. Storing this number is as follows:

1.) Select the "op code" switch (located to the right of Store/Recall under the Programming section). Op code LED should be lit.

2.) In loading Op codes, you key-in the A display first (the first five digits of your op code), then the B display. So, for this example, you key-in "10100" and then "enter" which is in the upper left hand corner of the key pad (the button is actually titled "units displayed"). Then you key-in the second set of five numbers: 41201 and then press enter. We have now stored the ten digit op code into memory. You should see 10100 in the left display. Usually at this point we then store the entire panel, including the op code, into a front panel memory location - a number from one to eighty. The storage of front panel set-ups are described in Section 3-2.

4-3 DESIGNING SINGLE PANEL OP CODES

1. Let's examine the example panel described in Section 4-2. (For the following op code examples refer to Figure 7.) The breakdown of the ten digit op code is as follows:

digit	description
1	Normal/new test
Ø	Flat Level
1	A channel
Ø	no change
Ø	no change
4	no weighting
1	AVG detection
2	dBm/6ØØ ohms
Ø	N/A
1	set reference level

The op code is doing everything you would manually do with the analyzer when making the same measurement (with the exception that you don't have to tell the analyzer to Start Inputs ...the op code does that automatically). The op codes were designed to strobe in set-up commands exactly as though you were pushing the front panel buttons of the analyzer.

2. Let's design another op code, this one attached to a generator front panel set-up that consists of 2ØØØ msec of terminated A&B channels. We want to measure the residual noise of a device under test with this panel. An appropriate op code would be"2211441ØØØ":

digit	description
2	Noise test
2	Ratio
1	A channel
1	22 Hz HP filter
4	8Ø kHz LP filter
4	no weighting
1	AVG detection
Ø	N/A (preset by test)
Ø	N/A (preset by test)
Ø	

3. Next, we'll design an op code for measuring the phase error in degrees of an incoming frequency sweep. That op code would be as follows: 36300-00000.

digit	description
3	Frequency sweep
6	Phase error in degrees
3	A&B channel (not nec - it would default there)
Ø	N/A (preset by test)
Ø	N/A (preset by test)

Ø	N/A	(preset	by	test)
Ø	"	"	"	"
Ø	"	"	"	"
Ø	"	"	"	"
Ø	"	"	"	"

4-4 PURE OP CODES

So far we have described op codes directly applicable to generator panel set-ups: fixed parameters (single sine waves), frequency sweeps, level sweeps, etc. There are other instances where we want to command the analyzer to perform a function, but where the command is not applicable to a generator function or set-up (print, set dB/step, Stop, etc). These instances are delineated and implemented as "pure op codes". A listing and brief description of pure op codes is as follows. See Figure 7 for additional reference.

pure op code	description
50000-00000	Print Data. Using this op code, the analyzer will print data and then stay in FSK mode.
51000-00000	Print Data & go to Local. 3200A will print out measurement results and then go to local command.
52000-00000	Start. This op code will initialize the 3200A inputs.
53000-00000	Stop. This op code will stop the analysis circuits. Generally, the last command before "print".
54000-00000	Go to Local. Strobing this op code would return the Analyzer to local control.

pure op code	description
55000-00000	Lock out Analyzer front panel control. With a remotely located analyzer you may want to prevent unauthorized usage of the analyzer during FSK control.
56000-00000	Clear Memory. Clears Analyzer memory at that point in time.

57000-00000	Store data into Memory. Would be used after op code 58000-00000 to return the Analyzer to normal operation. (During normal operations the analyzer automatically stores data into Memory).
58000-00000	No data stored. With this op code we are instructing the Analyzer not to store data.
59000-00000	Autoranging on. Would be used after op code 60000-00000 to return the Analyzer to normal operation. (it normally is always auto-ranging)
60000-00000	Autoranging off. Turns off the autoranging circuits in the Analyzer.
61000-XXXX0	Set dB/step. Described at the bottom of Fig. 7.
62000-XXX00	Set pts/decade. Described at the bottom of Figure 7.
64000-00000	Self Check. Puts the Analyzer through the Self Check paces.
65000-00000	New Test Number. Assume you have several different generator panels, but you want to make the same type of measurement with each generator panel. Normally each set of measurement results would have the same test number on the print-out or on view data. This op code tells the analyzer to increment one number on the test category each time it is strobed in.

To store a pure op code as a front panel set-up, press the FSK button until the LED is lit. Use the keypad to input the first 5-digits of the desired pure op code followed by pressing the UNITS DISPLAYED button. Then enter the last 5 digits of the pure op code followed by pressing the UNITS DISPLAYED button. Press the PROGRAM SETUP button until the STORE LED is lit.

Enter the desired memory position on the keyboard followed by pressing the UNITS DISPLAYED button. Although there may appear to be other data

* * * A DISPLAY * * *							* * * B DISPLAY * * *					
#	1st Character TYPE OF TEST	2nd Character MEASUREMENT	3rd CHANNEL	4th HP FILT	5th LP FILT		6th WEIGHTING FILTER	7th DETECTION	8th LEVEL UNITS	9th THD UNITS	10th MISC	#
0	No Op. Code	Flat Level	-*	-*	-*	0	-*	-*	-*	-*	-*	0
1	Normal/New Test	Filtered Level	A	22 Hz	15 kHz	1	A	AVG	Volts	%	Ref Set	1
2	Noise	Ratio	B	200 Hz	22 kHz	2	CCIR	RMS	600dBm	dB	Ranging on	2
3	F-Sweep	Notch Lock	A&B	400 Hz	30 kHz	3	EXT	Q-PK	150dBm		Ranging off	3
4	L-Sweep	THD vs. Level		none	80 kHz	4	None		Watts			4
5	Op codes **	THD vs. Freq.			none	5						5
6	Op codes **	Phase/Deg				6						6
7		Phase/Time				7						7
8		IMD				8						8
9		Channel Sep				9						9

* (-) means no change from last test (therefore code will not be transmitted). The setting will default to the code used in the previous test.

Pure op codes:

Number	Description
50000 00000	Print Data
51000 00000	Print Data, then go to local
52000 00000	Start (Analyzer)
53000 00000	Stop (Analyzer)
54000 00000	go to Local control
55000 00000	Lock out Analyzer front panel control
56000 00000	Clear Analyzer memory
57000 00000	Store data into memory
58000 00000	No data stored
59000 00000	Autoranging On

Number	Description
60000 00000	Autoranging Off
61000 00000	Set dB/step # into Analyzer memory**
62000 00000	Set pts/decade into Analyzer memory**
64000 00000	Self Check
65000 00000	New Test number

** The number of dB per step and pts/decade are stored into the 5 digits on the B display:

For example, in the case of db/step, a number of 61000-20000 would mean 20 dB/step. (you read the first four digits and move the decimal two places to the left). A number of 61000-00050 would represent .05 dB/step.

In the case of pts/decade, a number of 62000-00400 would represent 4 points/per decade. 62000-25500 would represent 255 pts/decade (you read the first three digits literally).

FSK rules:

1. To suppress the FSK bursts in an auto-sequence, recall the first panel of that auto-sequence and enter a leading zero in that panel's op code section (for example 04120-11200). Re-store the panel set-up. The auto-sequence will now run with FSK suppressed. Reverse the procedure to reinstate FSK.

2. In auto-sequence locations 9 through 16, the level and load impedance of the first panel encountered is used throughout the remaining fixed parameter and frequency sweep panels. To change the level of that auto-sequence, recall the first panel and change the level to the new number. Re-store the panel. The entire auto sequence will now run at that new level.

3. To delete an unwanted stored panel set-up, insert all zero's (00000-00000) into that panel's op code section.

Figure 7. **Operation Code Guide**

associated with this front panel set-up (frequency, duration, etc.), the 3200A will only recognize the pure op code, transmit it at the level contained in its associated front panel set-up and ignore the remaining unrelated data.

4-5 BUILDING AN AUTOMATED SEQUENCE

A typical automated sequence will consist of a combination of pure op code panels and normal panel registers which consist of generator frequency and level output coupled with the ten digit op code commanding the analyzer.

There is memory for the storage of up to 16 automated sequences or "proofs". These 16 automated sequences are broken down into two groups: autosequences 1 through 8, and 9 through 16. Autosequences 1 - 8 are reserved for those "proofs" where you will want to vary the level in the various frequency sweep and fixed parameter set-ups you may have throughout the autosequence. An example might be where you would want to set a reference at 0 dBm/600 ohm, check frequency response at -10 dB and check phase error at -20 dB. That type of autosequence belongs in the first eight autosequence numbers.

The last eight autosequence locations (9 through 16) are reserved for those autosequences where you want to run all frequency sweep and fixed parameter panels at a fixed_level. As mentioned previously in this manual, the last eight autosequences locations share the level and load impedance encountered within the first panel that is run in each autosequence. This necessitates storing only those autosequences where you desire a fixed level throughout (except in level sweeps) in locations 9 through 16. An example of where you would desire this type of capability is where you would have an

autosequence containing 60 front panel set-ups, all stored away at 0 dBm for instance. At the beginning of testing, you realize that you really need -2.50 dBm for the system under test. Rather than recall 60 different panel set-ups in order to change level, you merely need to recall the first panel encountered in the autosequence, change the level within that panel and re-store the panel set-up under its original number. When you re-run the auto-sequence, all of the appropriate panels will be output at your new level.

Let's evaluate the automated sequence listed in Figure 8 and detailed in the 3100A generator print-out shown in Figure 9. Also, see the Opera-tion's Guide to the 3000 series, section 2, for a detailed example of building an automated sequence.

We arbitrarily stored this auto-sequence within autosequence location six. Autosequence six consists of panels 20, 21, 24, 22, 23, 30, 25, 28, 26 and 27, in that order. The description of what each panel is doing is high-lighted to the right of each panel's print-out in Figure 9. Before building an automated sequence, conceptualize what it is you are trying to do with the automated sequence. The functions and measurement performed in auto-sequence six are as follows:

1. Clear Memory. We want to clear the memory prior to making any measurements. Failure to clear memory will result in printing out extraneous data from previous test runs (Panel 20).

2. Reference Level panel. Our reference will be based upon a single channel 1 kHz, 0dBm/600 frequency. Setting reference is necessary as we'll be performing signal-to-noise and frequency response measurements (Panel 21).

3. Measure residual noise. This panel set-up contains terminated outputs enabling us to analyze residual noise. The op code commanded the analyzer into the ratio mode (Panel 22).

4. Insert points-per-decade. This panel set-up is necessary for the analyzer to measure any incoming frequency sweeps. A 5 point-per-decade sweep is used consistently throughout this autosequence (Panel 23).

5. Measure the frequency response of a sweep. We built a 50 Hz to 15 kHz sweep with which to measure frequency response (as well as other parameters). The 10 digit op code commanded the analyzer into the Ratio mode to measure frequency response in dB (Panel 30).

6. Measure the THD vs. frequency of a sweep. The same sweep as in Step 6 above except with a different sweep-time-multiplier and we put the analyzer into the THD vs. Frequency mode (Panel 25).

7. Measure the phase error (in degrees) of a sweep. Same sweep as in Step 6. Op code commands the analyzer into measuring phase error in degrees (Panel 28).

8. Stop. Pure op code commands the analyzer to stop (Panel 26).

9. Print and go to local. Pure op code commands the analyzer to print out all data in its memory and then go to local command (Panel 27).

The print-out from the 3100A Generator of this automated sequence is shown in Figure 9. The print-out of measurement results from the 3200A Audio Analyzer is shown in Figure 10.

AUTO SEQUENCE NUMBER 6

	GENERATOR				ANALYZER			
MEMORY POSITION	CHANNELS	LEVEL	FREQ	PTS/ DECADE	PANEL DURATION/ TIME MULT.	OP CODE	TYPE OF MEASUREMENT	COMMENTS
20	-	-	-	-	N/A	56000 00000	-	clear memory
21	A	0dBm/600	1 kHz	-	4 sec	10100 41201	reference level	set reference
22	A&B	Termin.	1 kHz	-	4 sec	22114 12000	residual noise	filtered & Weighted
23	-	-	-	4	N/A	62000 00400	-	4 pts/decade
30	A	0dBm/600	50Hz/15kHz	4	40x	32145 42000	freq. resp.	-
25	A	0dBm/600	50Hz/15kHz	4	60x	35114 41010	THD	-
28	A&B	0dBm/600	50Hz/15kHz	4	35x	36300 00000	phase	-
26	-	-	-	-	N/A	53000 00000	-	stop
27	-	-	-	-	N/A	51000 00000	-	print & go to local

AUTO SEQUENCE SETTINGS: Source Resistance = 50 ohms
Load Resistance = 600 ohms
De-emphasis = Off

Figure 8. Sample Auto Sequence Set-up

```
GENERATOR ID :

                ST 3100A AUTO-SEQUENCE No. 6

PANEL No.  20

OP-CODE   5 6 0 0 0 0 0 0 0 0              0.00 dBm-600


PANEL No.  21

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz   4.000 Sec Dur

A-CH ON        RS = 50 ohms     RL = 100.00  Kohms DE-EMPH : Off
OP-CODE   1 0 1 0 0 4 1 2 0 1


PANEL No.  22

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz   4.000 Sec Dur

A&B-CH TERM    RS = 50 ohms     RL = 100.00  Kohms DE-EMPH : Off
OP-CODE   2 2 1 1 4 1 2 0 0 0


PANEL No.  23

OP-CODE   6 2 0 0 0 0 0 4 0 0              0.00 dBm-600


PANEL No.  30

FREQUENCY SWEEP     SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec     40 = TIME MULT
A-CH ON        RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
OP-CODE   3 2 1 4 5 4 2 0 0 0


PANEL No.  25

FREQUENCY SWEEP     SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec     60 = TIME MULT
A-CH ON        RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
OP-CODE   3 5 1 1 4 4 1 0 1 0
```

Figure 9. Generator Print-out of Auto-Sequence

```
PANEL No.  28

FREQUENCY SWEEP     SINE            0.00 dBm-600   15.000 kHz TO 50.000 Hz
     4 Pts/Dec     35 = TIME MULT
A&B-CH ON      RS = 50 ohms      RL = 600.00 ohms    DE-EMPH : Off
OP-CODE   3 6 3 0 0 0 0 0 0 0


PANEL No.  26

OP-CODE   5 3 0 0 0 0 0 0 0 0              0.00 dBm-600


PANEL No.  27

OP-CODE   5 1 0 0 0 0 0 0 0 0              0.00 dBm-600
```

Figure 9. (cont.)

```
TEST No. 1    *****  *****  *****

Generator ID :
Input A
Avg  Detector
      LEVEL                FREQUENCY
        0.02 dBU           1.0024 kHz
        0.03 dBU           1.0024 kHz


TEST No. 2    *****  *****  *****

Generator ID :
Input A
A Ref    0.02 dBU          1.0025 kHz
High Pass 22 Hz  Low Pass 80kHz        A Weighted
RMS  Detector
      RATIO                FREQUENCY
       - 109 dB             0.000 Hz


TEST No. 3    *****  *****  *****

Generator ID :
Input A
A Ref    0.02 dBU          1.0025 kHz
High Pass OFF     Low Pass OFF      Not  Weighted
RMS  Detector
      RATIO                FREQUENCY
        0.01 dB            14.978 kHz
        0.01 dB            8.5137 kHz
        0.00 dB            4.7912 kHz
        0.00 dB            2.6963 kHz
      - 0.01 dB            1.5117 kHz
        0.00 dB            845.64 Hz
        0.00 dB            475.93 Hz
      - 0.00 dB            267.86 Hz
      - 0.02 dB            150.19 Hz
      - 0.01 dB            84.828 Hz
      - 0.02 dB            50.238 Hz
```

Figure 10. Analyzer Print-out of Test Results

```
TEST No. 4    *****  *****  *****

Generator ID :
Input A
High Pass 22 Hz  Low Pass 80kHz   Not  Weighted
Avg  Detector
      THD                FREQUENCY          LEVEL
      0.0018 %           14.978 kHz          0.01 dBU
      0.0018 %           8.5137 kHz          0.01 dBU
      0.0015 %           4.7912 kHz          0.01 dBU
      0.0013 %           2.6963 kHz          0.00 dBU
      0.0014 %           1.5117 kHz          0.00 dBU
      0.0018 %           845.64 Hz           0.00 dBU
      0.0016 %           475.93 Hz           0.00 dBU
      0.0016 %           267.86 Hz         - 0.00 dBU
      0.0016 %           150.19 Hz         - 0.00 dBU
      0.0018 %           84.828 Hz         - 0.00 dBU
      0.0016 %           50.252 Hz         - 0.00 dBU


TEST No. 5    *****  *****  *****

Generator ID :
Input A&B
      PHASE              FREQUENCY
         0.1 deg         14.978 kHz
      -  0.0 deg         8.5137 kHz
      -  0.0 deg         4.7912 kHz
      -  0.0 deg         2.6963 kHz
      -  0.0 deg         1.5117 kHz
      -  0.0 deg         845.64 Hz
      -  0.0 deg         475.94 Hz
      -  0.0 deg         267.86 Hz
      -  0.0 deg         150.19 Hz
      -  0.0 deg         84.830 Hz
      -  0.0 deg         50.238 Hz
```

Figure 10. (cont.)

When building automated sequences number 9 through 16 it is advisable to start the sequence with a front panel set-up designed to establish the desired level and load impedance for the entire sequence. The first front panel encountered when running auto-sequence numbers 9 through 16 determines the level and load impedance for the remainder of the sequence. Since pure op code panels carry an associated level it is advisable to avoid starting an auto-sequence with a pure op code, as pure op code panels may be part of several different auto-sequences.

SECTION 5

FRONT PANEL CONTROLS

5-1 GENERAL

The 3100A Generator has 18 control buttons with 42 LEDs possible and 20 keyboard buttons. The buttons and LEDs are divided into seven functional groups. This Section provides a brief description of each button and LED.

5-2 PROGRAM GROUP

A. SET-UP RECALL. Used to recall front panel set-ups from memory.

B. SET-UP STORE. Used to store front panel set-ups into memory. Up to 80 front panel set-ups (numbers 1 through 80) can be stored in non-volatile memory.

C. FSK CODE. Used to enter frequency shift keying code number for remote control of 3200A Analyzer. Each front panel set-up must have a non-zero FSK operation code before it may be entered into front panel memory. FSK code may also be used to delete a front panel set-up from memory by inputting an operation code of "0000000000".

D. AUTOSEQUENCE. Used to recall existing auto-sequences or create new auto-sequences. Up to 16 auto-sequences can be stored in memory (numbers 1 through 16).

E. CHAIN. Used to link together front panel set-ups to form auto-sequences. Also used in conjunction with keyboard for editing of auto-sequences. Up to 80 front panel set-ups can be linked in each auto-sequence. A front panel set-up can also be used in numerous auto-sequences.

F. PRINT MEMORY. Used to print-out contents of front panel memory through standard parallel port. Two different reports are printed, providing a comprehensive numerical listing of auto-sequences and front panel set-ups.

G. GEN ID. Used to input a user-selected identification number for the 3100A Generator and security passcodes. Review Section 3-10 of this manual prior to entering a generator identification number. This identification number will appear in all print-outs and can be utilized when several different 3100A Generators are communicating with one or more companion 3200A Analyzers. The assigned Generator identification number will also appear on all print-outs from the 3200A Analyzer. The user may choose to use this as a date field or input any other desired numeric code of up to five digits.

5-3 WAVEFORM GROUP

A. SINE. Used in conjunction with the FIXED PARAMETER TEST MODE to output a sinewave of 1 Hz to 102.39 kHz. (1 Hz to 9.9 Hz only operational after initial usage of oscillator). Automatically selected when in FREQUENCY SWEEP TEST MODE. The 3100A Generator can output a sinewave of 10 Hz to 102.39 kHz while in the FREQUENCY SWEEP TEST MODE.

B. SQUARE. Used in conjunction with the FIXED PARAMETER TEST MODE to output a squarewave of 1 Hz to 50 kHz. (1 Hz to 9.9 Hz only operational after initial usage of oscillator). Squarewaves can be used in front panel set-ups but front panel set-ups cannot be accessed within an auto-sequence.

C. IM. Used in conjunction with the FIXED PARAMETER TEST MODE or LEVEL SWEEP TEST MODE to output SMPTE Intermodulation Distortion test signal. (IM is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 004, your unit has the ability to generate the IM signal).

D. LF OFF. Used in conjunction with the FIXED PARAMETER TEST MODE or LEVEL SWEEP TEST MODE to output SMPTE Intermodulation Distortion test signal without Low Frequency.

E. BURST. Used in conjunction with FIXED PARAMETER TEST MODE to output 100 Hz to 102.39 kHz toneburst. Frequency defined by usage of FREQUENCY button in PARAMETERS GROUP. Other characteristics (on time, off time, attenuation) defined by usage of functions in PARAMETERS GROUP. Toneburst signals can be stored in front panel set-ups but cannot be accessed within an auto-sequence. (Burst is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 005, your unit has the ability to generate Burst).

F. SINE/STEP. Used in conjunction with FIXED PARAMETER TEST MODE to output a 100 Hz to 102.39 kHz sinewave followed by a D.C. step signal equal to the peak amplitude of the sinewave. Frequency defined by usage of FREQUENCY button in PARAMETERS GROUP. Other characteristics (sine time on, step time on) defined by usage of functions in PARAMETERS GROUP. Sine/step signals can be stored in front panel set-ups but cannot be accessed within an auto-sequence. (Sine/Step is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 005, your unit has the ability to generate Sine/Step.

5-4 TEST MODE

A. FIXED PARAMETER. Used in conjunction with FREQUENCY or LEVEL in PARAMETERS GROUP and with selection from WAVEFORM GROUP.

B. FREQUENCY SWEEP. Used in conjunction with SWEEP button in PARAMETERS GROUP to define sweep characteristics. Automatically selects SINE in WAVEFORM GROUP.

C. LEVEL SWEEP. Used in conjunction with SWEEP button in PARAMETERS GROUP to define sweep characteristics. SINE and IM in WAVEFORM GROUP can be accessed.

D. AUTO-SEQUENCE. Indicates 3100A Generator is in Auto-Sequence mode. This LED is activated by usage of AUTO SEQUENCE button in PROGRAM GROUP. LED is deactivated by selection of other TEST MODE.

5-5 PARAMETERS GROUP

A. FREQUENCY. Used in conjunction with keyboard to define frequency of SINE, SQUARE, IM, BURST, SINE/STEP and FREQUENCY SWEEP.

LEVEL. Used in conjunction with keyboard to define signal level of SINE, SQUARE, IM, BURST, SINE/STEP and FREQUENCY SWEEP.

B. Maximum range of 24.5 milliVolts to 28.6 V, depending upon load, source impedance and output configuration. In auto-sequences 9 through 18, the first level setting encountered in the auto-sequence, will be used throughout that auto-sequence. Units of measure include millivolts, Volts, dBm 150 and dBm 600.

C. DURATION. Used when storing FIXED PARAMETER signals into front panel memory. Signals can be stored with 5 millisecond to 50 minute durations.

D. LOAD OHMS. Used in conjunction with keyboard to define load impedance of 50 ohms to 99,999 kOhms. Please note that whatever load impedance is input in the first front panel set-up encountered while running an auto-sequence, will be used throughout the remainder of that entire auto-sequence.

E. SWEEP START LIMIT. Used in conjunction with keyboard and FREQUENCY SWEEP or LEVEL SWEEP to define beginning point of sweep. Frequencies of 10 Hz to 102.39 kHz are available, level of -90 dBm 600 to 30.65 dBm 600 are available. Please note that sweeps can sweep upward or downward.

F. SWEEP STOP LIMIT. Used in conjunction with keyboard and FREQUENCY SWEEP or LEVEL SWEEP. Frequencies of 10 Hz to 102.39 kHz are available, level of -90 dBm 600 to 30.65 dBm 600 are available. Please note that sweeps can sweep upward or downward.

G. SWEEP PTS/DECADE or SWEEP dB/STEP. Used in conjunction with keyboard and FREQUENCY SWEEP or LEVEL SWEEP. Points per decade internally calculated to provide linear increments on a log frequency scale. 4 to 255 points per decade available. dB/STEP available from .05dB to 20.00dB in .05dB steps.

H. SWEEP TIME MULTIPLIER. Used in conjunction with keyboard, FREQUENCY SWEEP and LEVEL SWEEP. Sweep can be slowed from most rapid speed (TIME MULTIPLIER = 1) to take 999 times longer (TIME MULTIPLIER = 999). TIME MULTIPLIER can be set at any whole number between 1 and 999.

I. BURST TIME. Used in conjunction with keyboard, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define length of time that toneburst will be generated without attenuation. Duration of 10 milliseconds to 50 minutes available. Also used in conjunction with keyboard, FIXED PARAMETER TEST MODE and SINE/STEP WAVEFORM to define length of time in milliseconds that sinewave will be generated. Duration of 10 milliseconds to 50 minutes available.

J. ATTENUATED or STEP TIME. ATTENUATED TIME is used in conjunction with keyboard, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define length of time that toneburst will be attenuated. Duration of 10 milliseconds to 50 minutes available. STEP TIME is used in conjunction with keyboard, FIXED PARAMETER TEST MODE and SINE/STEP WAVEFORM to define duration in milliseconds of D.C. step signal. Duration of 10 milliseconds to 50 minutes available.

K. BURST ATTEN. Used in conjunction with keyboard, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define amount of attenuation in dB that toneburst will be reduced while attenuated. Available range of 5dB to 60dB in 5dB increments.

5-6 OUTPUTS

A. CHANNEL A, B. Defines whether only Channel A, only Channel B, or both Channels (both LEDs lit) will be output. If neither LED is lit, then both Channels are terminated.

B. SOURCE OHMS 50, 150, 600. Defines source ohms.

C. DE-EMPH 75, 50, 25, 10 microseconds. Used in conjunction with all waveforms and test modes. Defines de-emphasis curve used. If no LEDs are lit, then no de-emphasis curve will be used. (De-emphasis is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 006, your unit has De-emphasis capability).

D. REPEAT. Used in conjunction with FREQUENCY SWEEP and LEVEL SWEEP TEST MODE. Allows user to output continually repeating sweeps until STOP button or REPEAT button is pressed. This function is not available for usage within auto-sequences. REPEAT function is not used with FIXED PARAMETERS, as fixed signal is constantly output until STOP button is pressed. **IMPORTANT** Do not allow the 3100A Generator to continuoulsy output level sweeps for a long period of time. It is possible to leave the 3100A Generator in a REPEAT sweep condition and wear out the output attenuator relays.

Although the relays have an estimated life in excess of one million operations, it is possible to perform more than 100 sweeps per minute if the 3100A Generator is allowed to remain in a REPEAT sweep condition.

E. START. Used to initiate all test signals. Fixed signals or repeating sweeps will be constantly output until STOP button is pressed.

F. STOP. Used to cease generation of signals.

G. REMOTE. Indicator LED lit when 3100A Generator is being controlled by external controller via G.P.I.B. or RS-232 bus. LED is not user-accessible through button.

5-7 CALIBRATE/RESET

A. CALIBRATE. Used to recalibrate frequency range of 3100A Generator compared against internal standards. The 3100A Generator will automatically recalibrate the full frequency range of instrument upon turning the power switch on. BY pressing the CALIBRATE button when the STOP LED is lit, the 3100A Generator will recalibrate the full frequency range of instrument. If the CALIBRATE button is pressed, the AUTO SEQUENCE LED in the PROGRAM GROUP is lit, and the STOP LED is lit, all fixed parameter frequencies stored in all front panel set-ups will be calibrated. If the CALIBRATE button is pressed when a FIXED PARAMETER signal is being generated, the specific frequency being generated will be calibrated. Frequency accuracy after calibration is .03% for Fixed Parameter and .1% for sweeps.

B. RESET. After power is switched on, the 3100A Generator will always return to the state it was in at the point where power was turned off. It is possible, as with any microprocessor-controlled instrument, that some sequence of control actuations or transient conditions exist that could force the instrument into an undesired or unrecognized mode of operation. By pressing RESET, the 3100A Generator will return all location numbers within auto-sequences to location one and return the front panel to a factory determined set-up. No changes are made to stored front panel set-ups or auto-sequences. RESET may also be used to recover from abrupt power failures or other possible problems.

5-8 KEYBOARD

A. TOP ROW OF BUTTONS. Each of the four top buttons serve two functions. If the TEST MODE indicates AUTO SEQUENCE, then the 3100A Generator is being used to program the front panel memory. When programming the front panel memory, the left three buttons in the top row are used for editing memory (REPLACE, INSERT, and DELETE) when the CHAIN LED is lit in the PROGRAM GROUP. The right button in the top row is used in conjunction with the PRINT MEMORY LED in the PROGRAM GROUP to initiate printing.

If the 3100A Generator is in a TEST MODE other than AUTO SEQUENCE, the top row of buttons are used following keyboard entries to designate units of measure and automatically enter the data. The right button (UNITS DISPLAYED) is used to enter data in Hertz, Volts, Ohms, Points per Decade, Time Multiplier Units, or milliseconds. Unless an alternative button in the top row is desired, the UNITS DISPLAYED button should be used following each keyboard entry. The second button from the right allows the user to select units of measure of milliVOLTS and milliSECONDS and also automatically inputs the keypad entry (no enter command is needed). The third button from the right allows the user to select units of measure of kHertz, kOhms or dBm 600, and also automatically inputs the keypad entry (no command is needed). The left button allows the user to select dBm 150 as a unit of measure and also automatically inputs the keypad entry (no enter command is needed).

B. VERNIER/10dB STEPS. When this LED is lit, 10dB STEPS vernier function is operable. User can increase or decrease pre-selected level by 10 dB steps by pressing "up" or "down" VERNIER buttons in keyboard. The 3100A Generator will automatically adjust level by 10 dB without regard to level unit of measure selected. When LED is not lit, vernier can be used to increase or decrease pre-selected level or frequency by pressing "up" or "down" VERNIER buttons in keyboard.

C. CLR. Clear is used to remove incorrect data input via keyboard.

D. CHS (or "+/-"). Used to change sign of data input via the keyboard prior to data being entered into memory. As all keyboard entries are assumed to be positive, it is necessary to use CHS to input a negative number, such as -10 dBm 600.

E. Numeric Keys. Used to input various user-selected parameters. If the user input parameter is not within the acceptable range of the 3100A Generator, the 3100A Generator will default to the closest acceptable value and will indicate this value on the display. For example, if 110 kHz is entered, the 3100A Generator will default to 102.39 kHz and indicate this on the display.

Data input is not stored into memory until one of the four enter buttons (top row of keyboard) is used.

SECTION 6

G.P.I.B. (GENERAL PURPOSE INTERFACE BUS)

AND RS-232 BUS

6-1 GENERAL INFORMATION

The 3100A Generator may be operated under remote control by a suitable computer which utilizes either the G.P.I.B. or RS-232 bus. The G.P.I.B. is purchased as an option on the 3100A Generator. The RS-232 bus is standard equipment on all 3100A Generators. Except for POWER and PRINT, all front panel controls are fully programmable via G.P.I.B. or RS-232. Typical data rate when talking is 550 Bytes/s and when listening is 1 KB/s.

6-2 G.P.I.B.

A. What is the GPIB?

Some years ago, it was decided that there was a need for a general purpose interface bus that would allow different kinds of devices to communicate with each other. Even though these devices may be quite different from each other in what function they perform, they can still communicate with each other. Some devices may only be able to send data, like a tape reader. This type of device is known as a "Talker". Some devices may only be able to receive data, like a signal generator. This type of device is known as a "Listener". Some devices may be able to both talk and listen, like a digital voltmeter. Of course, some device may have to oversee these talkers and listeners while they are communicating. This type of device is called a "Controller".

The bus itself has many names. The three official names are:

1. IEEE 488-1978
2. ANSI MC1.1
3. IEC 625-1

These are all the same, except that the IEC bus uses a different connector. Adaptors for the IEC cable are readily available. Except for the IEC cable, the 3100A will work with any of the above names. Some common bus names used are:

1. IEEE-488
2. GPIB
3. HP-IB

In order for different instrument designers to be able to make their devices work on the bus, certain rules had to be made by the people who wrote the standard for the bus. The main part of these rules is called the interface Functions. These define the rules of bus communications. IF the reader desires a complete understanding of the bus, he should consult the document: "IEEE Standard Digital Interface for Programmable Instrumentation", available from the IEEE at 345 East 47th Street, New York, NY 10017.

B. What can the 3100A do on the GPIB?

The 3100A can both talk and listen and can also respond to most controller commands. It cannot act as a controller. Before going any further, it is necessary to discuss addresses. In order to know "who's who" on the bus, each device must have its own address. This can be any number between 0 and 30, inclusive. Addresses are used much like they are in the mail. If you want to send a letter to someone, you need to know their address. Address switches are usually found on the rear panel of a device, as on the 3100A. The procedure for setting the 3100A address is found later on in this section.

C. System Set-up

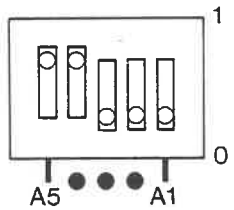
Up to 15 instruments can be connected on the bus, including the controller. However, the total length of all the cables used must be less than or equal to 2 meters times the number of devices connected to the bus, up to a maximum of 20 meters. Caution should be taken if individual cable length exceeds 4 meters. Not all devices must have their power on, but generally at least two-thirds of them should. Either of the two methods shown in Figure 8 can be used to connect up a system. Bus extenders are available for increasing the length of the cables.

6-3 ADDRESSING

The GPIB address switch is located on the rear panel. If the address is to be changed, it should be done so with the power switch off; otherwise, the microprocessor will not read the new address. The address is selectable from 1 to 30 and is factory set at 24. The switch is coded in binary (base two). Therefore, the factory setting of 24 appears as follows:

The address is:

A1 0 X 2 = 0
A2 0 X 2 = 0
A3 0 X 2 = 0
A4 1 X 2 = 8
A5 1 X 2 = 16
TOTAL: 24



GPIB ADDRESS SWITCH

6-4 REMOTE/LOCAL MODES

In remote, all of the 3100A front panel controls are disabled except those which are not controllable remotely and the RESET button. However, all LED displays and output levels are valid. In remote, the 3100A may be addressed to talk or listen. The "REMOTE" LED located by START/STOP button will light when the 3100A is in remote.

In local, the 3100A front panel is fully operational and the instrument will respond to the Remote message.

6-5 PROGRAMMING VIA G.P.I.B. OR RS-232

Programming syntax for the 3100A is derived from IEEE Std 782-1982, Recommended Practice for Code and Format Convention. The major difference between this syntax and that of the standard, lies in the sequence required to specify measurement units. The standard recommends use of a header field to describe units of measurements as well as function. The syntax for the 3100A uses a header only to define function or type of data and uses a suffix to define units of measurement. The structure of a command thus follows a customary sequence.

Function Numeric Data Units

In addition, this syntax requires a separator between data and the suffix which follows the data.

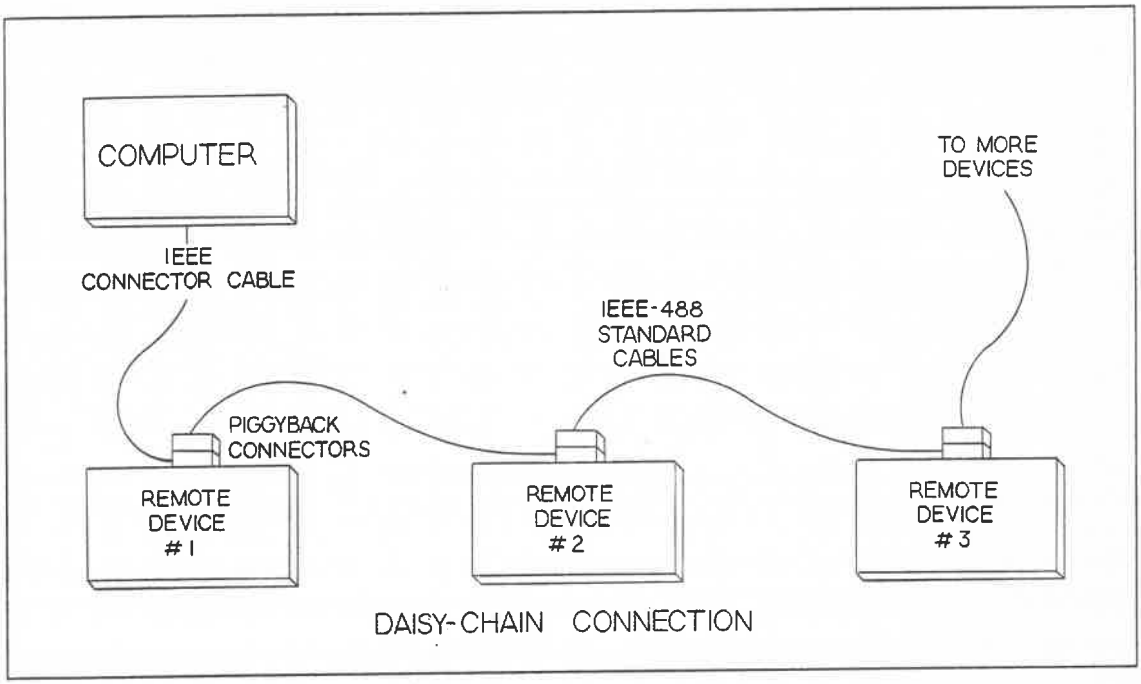
The general form for a program message (command) is:

Header Separator Data Separator Units Separator

A Header defines a function or the type of data which follows. A data message is the numeric string in "floating point" or exponential representation, i.e., 123.45 or 1.2345e2. For example, to program a start frequency, one might send the following "command" to the generator:

```
SFQ 4.23 kHz crlf   or
SFA 4.23 KHZ crlf   or
SFQ 4.23E+Ø3 Hz lf
```

The syntax allows interchangeable use of space and comma as separators and does not distinguish between upper and lower case alpha characters.



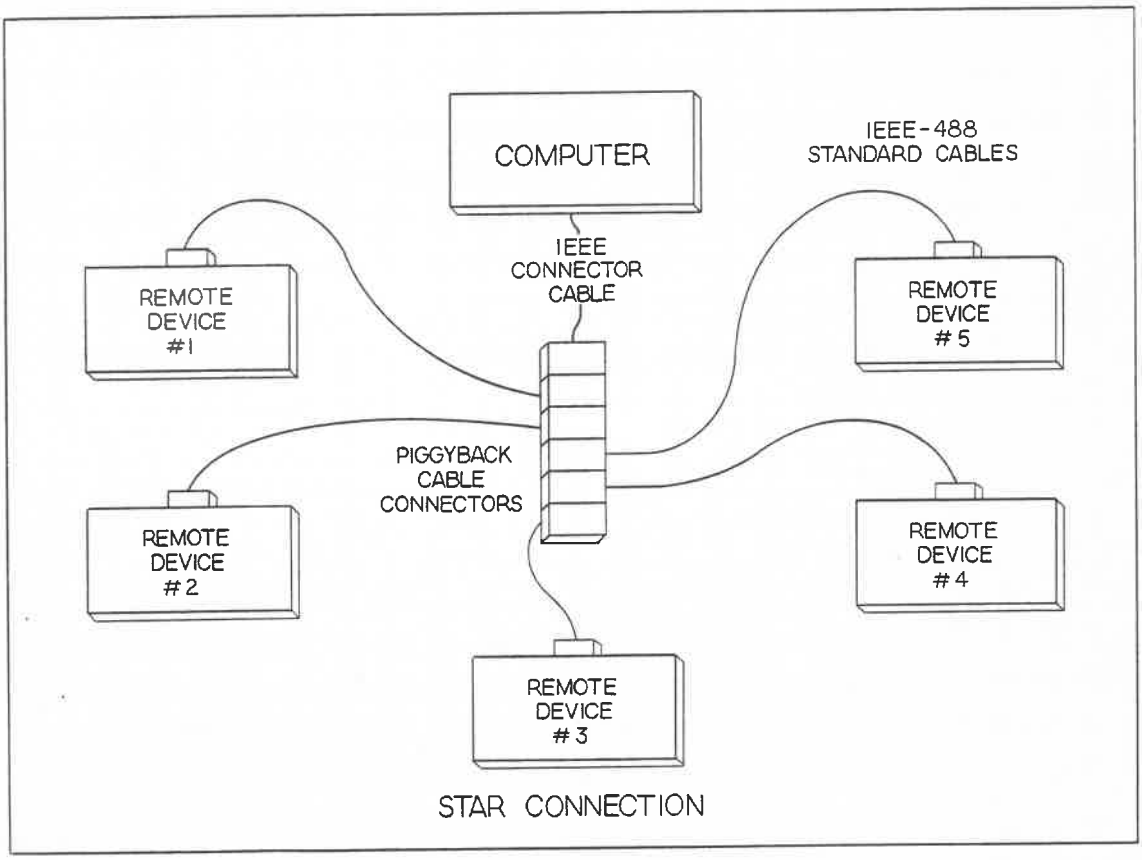


Figure 11. GPIB System Set-up

After a function or data-type command has been sent to the 3100A, it is not necessary to repeat the command until the function or data need to be changed. Command strings are limited to a maximum of 64 characters between cr or crlf terminators, which should not require any special care in programming. Extraneous delimiter characters that may be sent by some GPIB controllers will be removed automatically from the character stream and will not be counted in determining the maximum command string length.

In parsing a command input string, the 3100A processes each element of the string as it is encountered, just at it responds to equivalent operator entries into the front panel. When the 3100A cannot interpret a character sequence, it will ignore all characters after the offending sequence until an end of line terminator is encountered. In this event, status messages will identify the error and the offending character sequence.

Please note that the Start command (STR) is special in that any command which follows STR in a single line (until the next line terminator) will be completely ignored.

6-6 PROGRAMMING LANGUAGE FOR THE 3100A AUDIO GENERATOR

TEST MODE:

FRS	Frequency Sweep
FXP	Fixed Parameter
LVS	Level Sweep
SEQ	Auto Sequence

SWEEP PARAMETERS: Header must be followed by data.

DBS	dB per Step	also sets Level Sweep
EFQ	End Frequency	also sets Frequency Sweep
ELV	End Level	also sets Level Sweep
PPD	Points per Decade	also sets Frequency Sweep
SFQ	Start Frequency	also sets Frequency Sweep
SLV	Start Level	also sets Level Sweep
FTM	Frequency Sweep Time Multiplier	also sets Frequency Sweep
LTM	Level Sweep Time Multiplier	also sets Level Sweep

FIXED PARAMETERS: Header must be followed by data.

BRA	Burst Attenuation	sets Burst and Fixed Parameters
DUR	Duration	sets Fixed Parameters
FRQ	Frequency	ignored if not in Fixed Parameters or Level Sweep, status 112
LDR	LoadResistance	sets Fixed Parameters if in Auto Sequence Mode
LVL	Level	ignored if not in Fixed Parameters or Frequency Sweep, status 102
TON	Time On	ignored if not in Burst or Sine-Step
TAT	Time Attenuated	ignored if not in Burst or Sine-Step status 115

OUTPUTS:

A&B	A and B channels	sets Fixed Parameters if in Auto Sequence Mode
ABT	A and B channels Terminated	floating, terminated in selected source resistance, sets Fixed Parameters if in Auto Sequence Mode
ACH	A channel	B channel terminated, sets Fixed Parameters if in Auto Sequence Mode
BCH	B channel	A channel terminated, sets Fixed Parameters if in Auto Sequence Mode
CAL	Calibrate	
DE1	De-emphasis 10 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE2	De-emphasis 25 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE5	De-emphasis 50 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE7	De-emphasis 75 microsec	sets Fixed Parameters if in Auto Sequence Mode
DEO	De-emphasisOff	sets Fixed Parameters if in Auto Sequence Mode
NVR	Normal Vernier	0.05 dB steps after setting LVL
RPT	Repeat Sweep/AutoSeq	
SNG	Single Sweep/AutoSeq	
SR5	Source Resistance 50ohms	sets Fixed Parameters if in Auto Sequence Mode
SR1	Source Resistance 150ohms	sets Fixed Parameters if in Auto Sequence Mode
SR6	Source Resistance 600ohms	sets Fixed Parameters if in Auto Sequence Mode
STP	Stop Output	see note on page 50
STR	Start Output	(and start sweep or sequence)
TDB	Vernier Ten dB Steps	10 dB steps after setting LVL
VDN	Vernier Down	.01% freq steps after setting
FRQ,VUP	Vernier Up	increments chain location in Auto Sequence

WAVEFORM: Header is not followed by data

BRS	Burst	sets Fixed Parameters if in Auto Sequence Mode
IMD	IM Distortion	ignored if not in Fixed Parameters or Level Sweep (status 103)
SIN	Sine	sets Fixed Parameters if in Auto Sequence Mode
SNS	SineStep	sets Fixed Parameters if in Auto Sequence Mode
SQR	Square	sets Fixed Parameters if in Auto Sequence Mode

PROGRAM: Header must be followed by data

RCL	ReCaLL	recall the panel number which follows
STO	STOre	store a panel setup into a panel number
FSK		sets Fixed Parameters if in Auto Sequence Mode. Enter FSK code for controlling 3200A Analyzer in Auto Sequence Mode. First entry is left-hand display, second is right-hand display.
SEQ	Auto Sequence Number	select an auto sequence number for execution or for storage of chained panel setups entering (ENT) panel number automatically advances chain location number
IDN	Generator ID Number	sets generator identification number sets into Auto Sequence Mode

The above program commands are intended to facilitate loading and reading of panel-operated programs by an external controller. They may be used to program actions of the 3100A and 3200A, but if they are so used, the programmer should realize that his documentation of the program may become disconnected from reality.

UNITS:

DBU	dBm 600 ohm	All units entry words must be preceded by valid data. If not, a serial poll will be executed, status 99.
DBC	dBm 150 ohm	
Hz	Hertz	
OHM	Ohm	
KOM	kiloOhm	
MSC	millisec	
SEC	seconds	
MVT	milliVolts	
VLT	Volts	
ENT	Enters displayed units	In Auto Sequence Mode, data (chain no. 0-16) Followed by ENT sets the current chain location number to 1. In Chain Mode, ENT increments location number.

DATA REQUESTS:

ERR?	Error	Returns the string which caused last error
IDN?	GeneratorIDNumber	Returns the ID digit string, not the value
STS?	Status	Returns the status byte for the latest error; RS232 only. A GPIB controller obtains status by executing a serial poll.

SPECIAL:

SRQ Generate a service request and return status 43 hex (67) each time the 3100A has completed interpretation of a command line.

The facility provided by this command should be used if the GPIB controller does not send cr plus lf at the end of each command line and if it does not wait for handshake of the END message. It remains in effect until the 3100A returns to local control through a GPIB command to return to local or a RESET or power-on sequence in the 3100A.

Explanation: The 3100A defers interpretation of a command string from the GPIB until it receives an end of line (END) message (SR2 or SR3 of IEEE std. 728). The time required to interpret a command line is variable depending on the number and complexity of the commands in the line. For example, co-sider the programming sequence:

```
100    fxp sin frq 15.75 kHz lvl 0 dBm STR
110    wait 500 !(milliseconds)
120    frq 19 kHz STR
130    wait 500
```

If the controller does not wait for handshake of the END message, it will start timing the wait duration while the 3100A is interpreting the previous command string and neither wait in lines 110 and 130 will result in a signal being generated for 500 milliseconds.

STATUS CODES:

Whenever the 3100A cannot interpret a command, or at the completion of a requested action, a service request will be executed and a status byte will be available to the controller via a serial poll. The meaning of the status bytes is as follows:

Hex	Decimal	
40	64	Completion of Frequency sweep.
41	65	Completion of Level sweep.
42	66	Completion of an auto sequence.
43	67	Interpretation of command is complete. (must be requested by SRQ command).
60	96	Command doesn't match anything in list of commands
61	97	Data was expected, an E for exponential notation was found, but the characters following the E did not denote a valid exponent value.
62	98	Data was expected and an E was found, but non-numeric characters precede the E.

Hex	Decimal	
63	99	A units code was received but not preceded by a numeric string. Note that any string containing an E will be analyzed as though it is numeric whenever numeric data is expected, so a string with an E will fail with status bytes 61 or 62, not 63.
70	112	The code FRQ was interpreted, but the 3100A had not been programmed for Fixed Parameters or Level Sweep
71	113	The code LVL was interpreted, but the 3100A had not been programmed for Fixed Parameters or Frequency Sweep.
72	114	The code IMD or ILO was interpretated but the 3100A had not been programmed for Fixed Parameters or Level Sweep.
73	115	The code TON or TAT was interpreted but the 3100A had not been programmed to BURST or SINE/STEP.
74	116	The command string length exceeds 80 characters.
75	117	No device on the GPIB has been addressed to listen to the 3100A.
76	118	The data was syntactically correct but not in the available range for the value being programmed. The 3100A has set the programmed parameter to the closest limit value.
77	119	Panel and sequence programming is prevented by a security code stored in Generator ID.
79	121	IMD Option /004 is not installed.
7A	122	De-emphasis Option /006 is not installed.
7B	123	Special Functions Groups Option /005 is not installed.

When there is no doubt which state the 3100A must be in, a command does not have to be preceded by all the commands which would have to be executed from the front panel in order to arrive at the same state. For example, it is not possible to enter the start level for a Level Sweep from the front panel unless the 3100A is already in the Level Sweep state. The code start level, SLV, received over the GPIB, will set the 3100A into the Level Sweep state and need not be preceded by the command LVS. For the few cases which are ambiguous, the 3100A will ignore commands which are received while it is not in the proper state and generate a service request to show the error. These cases are:

FRQ
IMD
ILO — May be specified for either Fixed Parameter or Level Sweep Test Modes

LVL — May be specified for either Fixed Parameter or Frequency Sweep Test Modes.

TON — May be specified for either Burst or SINE/STEP Waveform states.

NOTE ON STOP COMMAND:

The STP command is included for completeness, but is not necessary for normal programming. Receipt of a new command generates an automatic stop before the new command is initiated if the Test Mode is changed by the new command.

Status byte values have been chosen so that:

Values less than 60 hex, 96 decimal indicate normal instrument operation. A service request indicates completion of a requested operation.

Values equal to or greater than 60 hex indicate abnormal operation. There are two sub-groups divided according to whether or not that status code itself indicates the precise error.

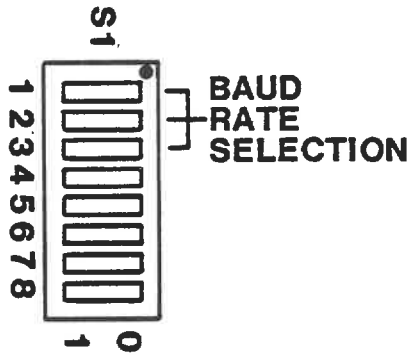
Values from 60 hex through 63 hex indicate syntax errors which may be identified by sending the command ERR? and then reading the incorrect string from the 3100A.

Values 70 hex and higher indicate specific programming error which are identified uniquely by the status byte value.

6-7 Setting the Baud Rate for RS-232 Communications

The 3000 series test instruments allow the operator to select from 8 baud rates. The baud rate is selected by configuring the dip switch located on the input/output board of the 3100A and 3200A. The switch is preset to 1200 baud at the factory. To access this switch, first remove the front panel of the instrument by removing the four screws and the joined connectors between the front panel assembly and the various printed circuit boards. After you are grounded to prevent damage to static sensitive components, remove the input/output board. In the 3100A the input/output board is the second board from the left when looking at the front panel. In the 3200A the input/output board is the third board from the left when looking the front panel. The printed circuit board is marked "02100-30010" on the lower front corner. There is a dip switch located on the front of the printed circuit board marked S1. This is the only dip switch on this board.

By configuring the first three switches the baud rate can be selected as follows:



Baud Rate	S_1 1 2 3	Period of Waveform at U8-9
110	0 0 0	570 us
150	1 0 0	417 us
300	0 1 0	208 us
600	1 1 0	104 us
1200	0 0 1	52 us
2400	1 0 1	26 us
4800	0 1 1	13 us
9600	1 1 1	6.5 us

Figure 12 Baud Rate

6-8 Programming via RS-232 from a Terminal or Modem.

The 3000 series test instruments may be programmed via an RS-232 serial communication port. A standard DB-25S connector is mounted on the rear panel of the instrument. Data and control lines from the connector terminate at an array of posts on an I/O printed circuit board, where they are connected by push-on jumpers to the data and control lines of the port circuitry. Choice of baud rate, character length, parity, number of stop bits, and protocol is selected on a DIP-switch mounted on the I/O board.

To gain access to the I/O board, remove the four or six front panel screws and carefully pull the front panel assembly toward you. The front panel assembly will be self-standing in front of the instrument. The I/O board is identified by the presence of an 8-position DIP-switch mounted at the front center of the board. If you wish to change only the functions controlled by the DIP-switch, you do not have to remove the I/O board from its socket. If you wish to change the connection of the data and control lines, you will have to remove the I/O board completely from its card cage to gain access to the jumpers which connect internal and external lines. To do so, make sure you are gounded to prevent damage to static-sensitive circuits, disconnect the power and ribbon cables to the front panel, then swing the front panel out of the way and remove the I/O card using the extractor at its bottom corner.

The function of each switch of the 8-position DIP-Switch is as follows:

SWITCH	FUNCTION
1, 2, and 3	Select baud rate, 8 choices from 110 to 9600.
4	Select character length, 7 or 8 bits.
5	Enable or disable parity.
6	Select odd or even parity if enabled by switch 5.
7	Select XON/XOFF or DTR protocol to allow the 3000 to hold off the controller or modem.
8	Select 1 or 2 stop bits.

The unit is preset at the factory with the following selections:

Baud rate 1200.
Character length 8 bits.
Parity disabled.
DTR protocol.
1 stop bit.

Figure 13 shows how to set these switches.

Connection of the data and control lines for use of the 3000 series instruments as either DTE (Data Terminal Equipment) or DCE (Data Control Equipment) is achieved by arrangement of the push-on jumpers provided. If the unit is to be connected directly to a modem, it should be configured as a DTE unit. Conversely, if it is to be connected directly to a terminal or computer system which emulates a terminal, it should be configured as a DCE unit. A diagram of the connections is shown in Figure 14. The unit is preset at the factory as DTE, ready to connect directly to a modem. Figure 15 shows two possible configurations for placing jumpers. Your system may require a different configuration. The 3100 and 3200 require that their

CTS lines be asserted to enable them to transmit, so they may be "held off" from transmitting by control of the CTS line by your controller. The 3100 and 3200 assert their RTS lines at power-on and assert them continuously.

Programming via RS-232 uses the set of commands listed for the IEEE 488 bus. The command STS? is provided specifically for RS-232 programming so that the controller may read the error code stored at the time of the latest programming error. Errors are indicated to the controller in two different ways:

1) Transmission of a NAK character (hex 15, ^U) for those errors which may be uniquely indentified by a status code, or

2) Transmission of a NAK character, followed by an echo of the character string which cannot be interpreted by the 3100 or 3200, followed by a ? and blank.

A NAK character alone will be returned for those errors listed for status code of 63 hex or higher in the 3100 and 65 hex or higher in the 3200. For example, if the string "Lvl 100 vlt" is sent to the 3100, the 3100 will set the level to the highest possible value, return a NAK to show an error in programming, and store the value 76 hex for return by the command STS?. if the string "Lvl 0 dBm" is sent to the 3100, it will echo the following string:

NAK cr lf "DBM?"

In this case, status code 60 hex will be stored. Note that the quotation marks are used here only to delineate the string, and are not sent by the 3100 or 3200.

The time required by the 3100 or 3200 to interpret each command string sent by the controller is variable and depends on the number of commands in the string and their complexity. Interpretation does not start until an end-of-line character (cr) is received. Use of either XON/XOFF or DTR protocol allows the instruments to hold off the controller until the command string has been interpreted. The pertinent sequence of events is:

Controller send command string and cr
3100 or 3200 asserts DTR or sends XOFF (13 hex, ^S, also named DC3)
3100 or 3200 interprets the command string
3100 or 3200 de-asserts DTR or sends XON (11 hex, ^Q, also named DC1)

If the controller waits until the 3100 or 3200 completes interpretation of the command string, the program in the controller may use its own wait statements to, for example, precisely control the time that a signal is output by the 3100, with no concern for the complexity of the command string preceding a STR command, Note that the 3000 instruments will always use either DTR or XON/XOFF protocol, depending on the setting of switch 7 on the I/O board. If neither protocol is desired, chose DTR protocol and remove the jumper which connects the DTR line to the RS-232 rear panel connector.

Although the baud rate may be selected for eight discrete values between 110 and 9600, the 3100 and 3200 will not be able to process a continuous character stream at 9600 baud. If your controller is capable of sending a command line in a continuous stream at 9600 baud, you will have to limit the data rate by selecting 4800 baud.

The 3100 or 3200 will ignore all characters, except the last, that are sent to them while they are interpreting a previous command string.

Completion of events in the 3000 series instruments which take an unpredictible length of time will be signalled by transmission of an ACK character (6 ^F) to the controller. These events are:

EVENT	STATUS CODE
In the 3100A	
Completion of a Frequency sweep	40 hex
Completion of a Level sweep	41 hex
Competion of an Auto Sequence	42 hex
In the 3200A	
Completion of printout on parallel printer	44 hex
Completion of remote self-check	4F hex

When even or odd parity is selected by switches 5 and 6, the 3000 series instruments will attach the parity bit to each character they return to the controller, but they do not react to parity errors. They will attempt to interpret the input string and indicate an error only if the string cannot be logically interpreted.

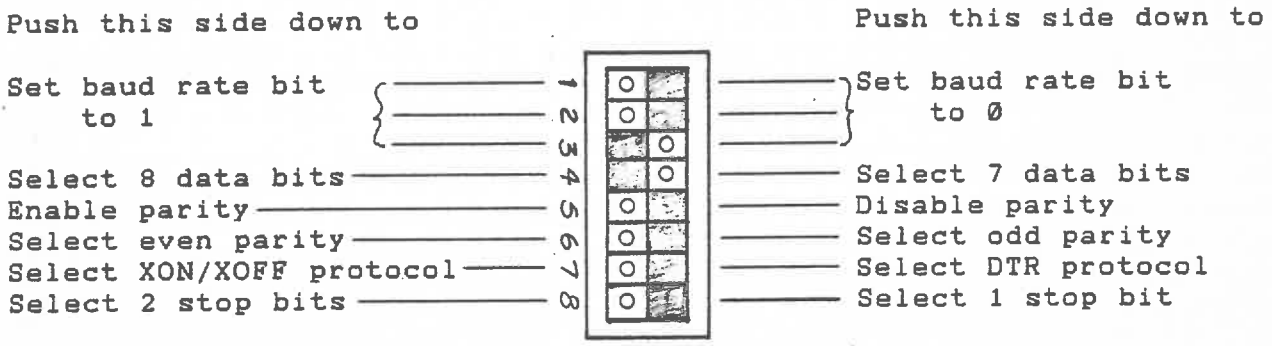
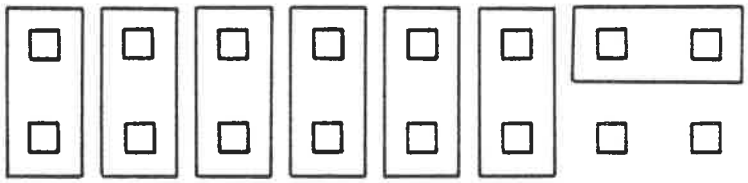
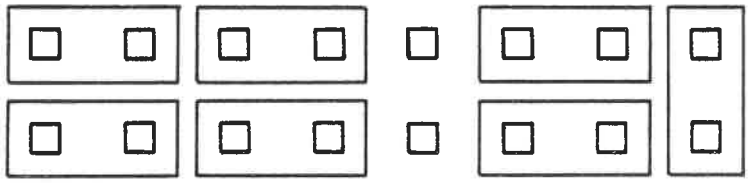


Figure 13 Selector DIP-switch on I/O board



Connection as Data Terminal Equipment (DTE)
(As Shipped)



Connection as Data Control Equipment (DCE)

Figure 14. DCE and DTE Jumper Configuration

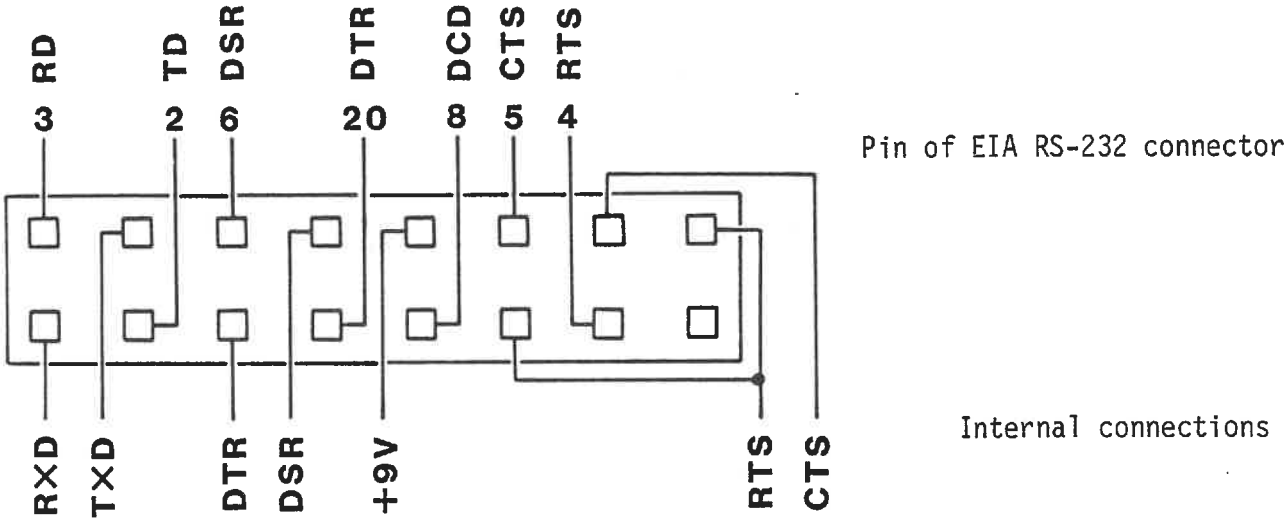


Figure 15. Pin-out of RS-232 Connection

SECTION 7

MOST COMMON USAGE PROBLEMS

7-1 GENERAL

The 3100A Generator is an extremely flexible and powerful device with extensive programming capabilities. As with any complex device, there are some common input errors that may occur. To assist you in diagnosing or preventing possible errors, the following list of difficulties and suggested remedies is provided. **IMPORTANT** The 3100A Generator can generate high level output of up to 30 dBm into 600 ohms with both channels driven. Check that your load resistance or device under test will not be damaged before accessing any output level in excess of 10 dBm 600.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Keyboard unresponsive, all LEDs lit	Transient Power Lock	Turn power off. Allow at least 5 seconds between turning off and on. If this does not correct situation, press RESET button. If keyboard remains unresponsive, contact factory.
Keyboard unresponsive, proper LEDs are lit	Stuck switch	Check that all switches are "free and clear." Check for button stuck in depressed condition.
Keyboard and front panel unresponsive	Printer not connected on line	User has pressed PRINT MEMORY button in keyboard and printer is not connected or is not ready to print. To recover, turn power switch off, wait 10 seconds and turn power back on.
Cannot access function	Unit does not include option	Intermodulation signal, Toneburst, Sine/Step and De-emphasis are optional equipment. Options can be retrofitted in field. Call factory for more information.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
CALIBRATE LED remains lit for several minutes	Software Lock	Turn power off. Allow at least 5 seconds between turning off and on. If this does not correct situtation, press RESET button. If CALIBRATE LED remains locked, contact factory.
CALIBRATE LED flashes for a few seconds after each FIXED PARAMETER frequency is keyed in	Frequency calibration software problem	Turn power off. Allow at least 5 seconds between turning off and one. If this does not correct situation, press RESET button. If keyboard remains unresponsive, contact factory.
No signal being output	Output configuration incorrect	Check CHANNELS LED for channel(s) being output versus channel(s) connected to device under test. If CHANNELS LED is not lit, then both channels are terminated. Also check that START green LED is lit.
No signal being output	Both channels being monitored on two channel oscilloscope with phase reversal	Invert connector on one channel to oscilloscope. Phase reversal into grounded device (oscilloscope) shorted outputs. See Section 2-1.
Unexpected signals being output	FSK code output	Brief tonebursts will be transmitted if FSK operation codes are being used. If using analyzer other than 3200A Analyzer, FSK operation codes should be suppressed. See Section 3-6.

7-2 FIXED PARAMETER TEST MODE

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access frequency LED during IMD test	IM uses pre-determined frequencies	Intermodulation signal waveform has pre-determined frequencies (as per SMPTE).
Sine/step or burst waveform not working properly	Incorrect parameters selected	Frequency of sine must equal or exceed 100 Hz, sine burst time and step on time must equal or exceed 10 milliseconds.
Duration function not limiting signal time	Only functional in auto-sequence test mode	Signal duration is only applicable when signal is stored in front panel memory for later use in auto-sequence. Fixed parameter signal is continuously output if user is not running signal from front panel memory during auto-sequence.

7-3 FREQUENCY SWEEP TEST MODE

Cannot access Square-wave, IMD, Burst or Sine/Step	Incorrect waveform selected	Sine is the only waveform allowed during frequency sweep.
Sweep not outputting 1 Hz to 9.99 Hz	Incorrect parameter selected	Sweep range during sweep is from 10 Hz to 102.39 kHz
Cannot access duration LED	function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep.
Frequency indicated in right display does not correspond to start or stop frequency limits	-	If not accessing start or stop frequency limits, right display will indicate last Fixed Parameter frequency used by the 3100A Generator. Check START LIMIT and STOP LIMIT SWEEP buttons.

7-4 LEVEL SWEEP TEST MODE

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access Squarewave, Burst or Sine/Step	Incorrect waveform selected	Sine and IM are the only waveforms allowed during level sweep.
Cannot access duration LED	Function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep.
Cannot select starting and stopping limits using mV or V	Unit of measure incorrect	Start and stop limits only available in dBm 150 and dBm 600.
Level indicated in left display does not correspond to start or stop level limits	-	If not accessing start or stop level limits, left display will indicate last Fixed Parameter level used by the 3100A Generator.

7-5 FRONT PANEL SET-UPS

Front panel set-up cannot be recalled (left display indicates "- - -")	No front panel set-up stored in that memory location	follow procedure in Section 3-2 to store front panel set-up. Also, check FSK code to make sure it contains at least one non-zero digit.
Changes made to front panel set-up are not changing signal	Changes not stored into memory	Follow procedure in Section 3-4. It is necessary to use STORE Function before changes are recorded in memory.
RECALL LED will not light	Front panel memory protected by passcode	Enter passcode (see Section 3-10).

7-6 AUTO-SEQUENCES

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access auto-sequence test mode	Incorrect test mode selected	Press AUTO-SEQUENCE button in PROGRAM Group.
Auto-sequence cannot be recalled	Incorrect parameter selected	Auto-sequences cannot be assigned number greater than 16. Auto-sequence LED in PROGRAM Section must be lit.
EDIT buttons not functioning	Improper function selected	CHAIN LED in PROGRAM Group must be lit for edit functions to work.
CHAIN LED will not light	Front panel memory protected by passcode	Enter passcode (see Section 3-10).
Front panel set-up will not store within auto-sequence	Memory not being accessed	Follow procedure in Section 3-6. Check that REPLACE button is being pressed after keyboard entry of front panel set-up number. Also make sure CHAIN LED is lit when accessing REPLACE button.
Unexpected signals being output	FSK code output	Brief toneburst will be transmitted throughout auto-sequence if FSK operation codes are being used. If using analyzer other than 3200A Analyzer, FSK operation codes should be suppressed. See Section 3-6.
Front panel set-up within auto-sequence is being ignored. No signal generated	Front panel set-up has unacceptable parameters.	Front panel set-ups using Burst and Sine/Step waveforms will be ignored within an auto-sequence. Also, a front panel set-up may contain all zeros in operation code, which means it will be ignored or hidden in auto-sequences.
Level being output is different than expected	Level over-ride feature	In auto-sequence numbers 9 through 16, the first Fixed Parameter level setting encountered will be used throughout the entire remaining auto-sequence. **NOTE** If the auto-sequence is started other than at location one, the level will be set based upon the first Fixed Parameter level encountered. See Section 3-6.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Auto-sequence does not start, or starts other than where expected	-	The auto-sequence will start at the location number specified in display and continue until it encounters a location number with an associated front panel set-up number "00". Scroll the auto-sequence to an appropriate beginning location before starting the sequence.
Load impedance is different than expected	Load impedance override feature	The first load impedance setting encountered within an auto-sequence will be used throughout the entire remaining auto-sequence. **NOTE** If the sequence is started other than at location one, the load impedance will be set based upon the load impedance in the first front panel set-up encountered. See Section 3-6.
3200A Analyzer is not performing measurements while using 3100A Generator in auto-sequence mode	no FSK code being transmitted	If the operation code in the first front panel set-up encountered while running an auto-sequence contains a leading zero, then FSK code transmission will be suppressed throughout the entire remaining auto-sequence. If the auto-sequence is started at other than location one, check to make sure that the front panel set-up contains a valid operation code. See Section 3-6.
Printout shows Analyzer is missing a test	insufficient time duration in panel	Recall the panel that refers to the particular test that the Analyzer is missing. Double the time frame currently stored within the duration category. Re-store the panel and re-run the autosequence. If the analyzer still misses the test, contact the factory for assistance.
Printout shows multiple readings for one fixed parameter	readings are outside of Analyzer "default" tolerances	If only one reading is desired for each fixed parameter, make sure that there is a leading "3" on the ten digit op code if it is frequency related and a leading "4" if the panel is level related. Therefore, if you have a low number for either pts/decade or dB/step, the Analyzer will automatically discriminate the incoming signal and then just give you one reading.

7-6 AUTO-SEQUENCE TROUBLESHOOTING, continued

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Inconsistant readings associated with incoming freq. or level sweeps	Insufficient sweep time multiplier	The 3200A Analyzer manual contains a section (section 3-3) on "rules of thumb" regarding sweep time multipliers as they relate to Analyzer test functions. You may follow the conventions noted and still obtain inconsistancies based on your measuring environment. Recall the panels in question and increase the STM numbers and restore the panel(s). Re-run the autosequence and see if the measurements have stabilized. If not, verify the inconsistant reading(s) manually before contacting the factory for assistance - the Analyzer may be accurately reflecting an anomaly in the system under test.
"Pure op code" command not triggering the Analyzer	Insufficient level in op code panel	Recall the panel number containing the "pure op code". Select the Level LED switch position and note the level on the left hand LED display. It should be at least 50 milliVolts. If it is not, increase the level to 1/2 a Volt or so and restore the panel. Re-run the autosequence and verify that the analyzer received the pure op code. If not, contact the factory.

SECTION 8

MAINTENANCE

8-1 GENERAL

CAUTION: Do not attempt to repair any fault inside the 3100A Generator. Specialized test equipment and procedures are required to obtain the specified performance. Also, certain components in the 3100A Generator are subject to damage by electrostatic voltages which can occur during handling or probing.

IMPORTANT: The push button switches are permanently lubricated. Application of any lubricant or contact cleaner will shorten their operational life.

8-2 PERIODIC MAINTENANCE

The only user serviceable part is the fuse located on the rear panel.

If the unit is not operating correctly, please contact our Customer Service Department at (408) 378-6540 for assistance in correcting the problem. Specify the 3100A Generator serial number (serial number tag located on rear panel of unit) when telephoning.

APPENDIX 1

3000 SERIES PRINTER PORT SPECIFICATIONS

3000 SERIES PRINTER PORT PINOUT

All standard Centronics printers are supplied with an Amphenol #57-40360, 36-pin interface connector (Centronics #31310019). The pin assignments, name, source and description for each interface signal is listed below.

Parallel Interface Connector	3000 Series Connector	Signal Name	Source	Description
Pin 1,19	Pin 1,19	DATA STROBE	3000	A 1.0 usec pulse (min) used to clock data from the processor to the printer.
Pin 2,20	Pin 2	DATA BIT 1	3000	Data bus
Pin 3,21	Pin 3,20	DATA BIT 2	3000	Data bus
Pin 4,22	Pin 4	DATA BIT 3	3000	Data bus
Pin 5,23	Pin 5,21	DATA BIT 4	3000	Data bus
Pin 6,24	Pin 6	DATA BIT 5	3000	Data bus
Pin 7,25	Pin 7,22	DATA BIT 6	3000	Data bus
Pin 8,26	Pin 8	DATA BIT 7	3000	Data bus
Pin 9,27	Pin 9,23	DATA BIT 8	3000	Data bus
Pin 10,28	Pin 10	$\overline{\text{ACKNOWLEDGE}}$	Printer	Data request pulse sent by the printer.
Pin 11,29	Pin 11,24	BUSY	Printer	Signal which indicates the status of the printer. The signal is high when the printer is busy and cannot receive new data.

Parallel Interface Connector	3000 Series Connector	Signal Name	Source	Description
Pin 12	Pin 12	PAPER EMPTY	Printer	Signal which indicates that the printer is out of paper.
Pin 13	Pin 13	SELECT	Printer	Signal which indicates that the printer is on line.
Pin 14	Pin 14	GROUND	Printer	Ground return.
Pin 15	No Connection			
Pin 16	No Connection			
Pin 17	No Connection			
Pin 18	No Connection			
Pin 31,30	Pin 16,25	$\overline{\text{INPUT PRIME}}$	3000	Printer reset which is only sent when the 3000 is turned off.
Pin 32	Pin 15	$\overline{\text{FAULT}}$	Printer	Signal which indicates an error or fault condition.
Pin 33	No Connection			
Pin 34	No Connection			
Pin 35	No Connection			
Pin 36	Pin 17	$\overline{\text{SELECT IN}}$	3000	Signal which will automatically put the printer on line, this is not supported by all printers.

(note; second pin number indicates a ground return)

APPENDIX II

3100 G.P.I.B. Programming
Example using the Hewlett Packard 85

```
10 ! File "RN3100"  Example hp85 program for the
20 !  Sound Technology 3100A.                    1986-12-19
30 DIM E$[16],N$[2],C$[6]
40 C$="ABCDEF"
50 G9=724
60 SFLAG 1
70 SET TIMEOUT 7;5000
80 ON TIMEOUT 7 GOSUB 9800
90 ON INTR 7 GOSUB 9200
100 ENABLE INTR 7;8
110 WAIT 10
120 CFLAG 1
200 N=0
500 DATA 16.5,12.5,10,8,6.3,5,4,3.15,2.5,2,1.6,1.25,1
510 DATA 800,630,500,400,315,250,200
700 !
710 ! Program output configuration.
720 !
730 OUTPUT G9 ;"sin ldr 600 ohm sr5 dec"
740 !
800 ! Program level sweep parameters.
810 !
820 OUTPUT G9 ;"slv 10.0 dBU elv -10 dBU dbs 2 ent"
830 OUTPUT G9 ;"ltm 5 ent sng Bch"
840 !
900 ! Program frequency sweep parameters.
910 !
920 OUTPUT G9 ;"sfq 41 kHz efq 180 Hz ppd 18 ent ftm 1 ent"
950 !
1000 N=N+1
1010 DISP "Running cycle";N
1020 SFLAG 2
1030 !
1040 ! Set the flag before you program the 3100.
1050 !
1060 OUTPUT G9 ;"lvs frq 1 kHz Bch STR"
1070 IF FLAG(2) THEN 1070
1080 !
1090 ! Program timing is taken over by the
1100 ! 3100 until it completes the sweep.
1110 !
1120 OUTPUT G9 ;"fxp lvl 100 vlt ABt STR"
1130 !
1140 ! 100 volts is too high.
1150 ! The 3100 should output 26.4 volts and send an SRQ.
1155 !    Status = 76hex.
1160 !
1170 WAIT 2500
1180 SFLAG 2
1190 OUTPUT G9 ;"Ach lvs STR"
1200 IF FLAG(2) THEN 1200
1210 SFLAG 2
1220 OUTPUT G9 ;"frs lvl 0 dBU Bch STR"
1230 IF FLAG(2) THEN 1230
1240 OUTPUT G9 ;"fxp lvl 1 vlt frq 1 kHz ABt STR"
1250 WAIT 500
1260 SFLAG 2
```

```
1270 OUTPUT G9 ;"frs lvl 0 dBU Ach STR"
1280 IF FLAG(2) THEN 1280
1290 OUTPUT G9 ;"fxp frq 2 kHz Ach STR"
1300 WAIT 2500
1310 OUTPUT G9 ;"lvl -10 dBU frq 11.8 kHz A&B"
1320 WAIT 40
1330 OUTPUT G9 ;"5.7 kHz"
1340 WAIT 40
1350 OUTPUT G9 ;"2.8 kHz"
1360 WAIT 40
1370 !
1380 ! Program level and channel for a series
1385 !    of discrete frequencies.
1390 !
1400 OUTPUT G9 ;"lvl 0 dBU Bch frq"
1410 GOSUB 2000
1420 OUTPUT G9 ;"Ach"
1430 !
1440 ! 200 Hz will appear on channel A until the new frequency
1450 !   is programmed. If this is undesireable, program a STP
1460 !   or change frequency before you change channel.
1470 !
1480 GOSUB 2000
1490 GOTO 1000
1500 !
2000 RESTORE
2010 FOR I=1 TO 20
2020 READ F
2030 OUTPUT G9 ;F
2040 IF I<14 THEN OUTPUT G9 ;"kHz" ELSE OUTPUT G9 ;"hZ"
2050 WAIT 1000
2060 NEXT I
2070 RETURN
```

```
8900 ! The following interrupt routine is sufficiently
8910 !  complete to detect any programming errors as well
8920 !  as process the sweep-end interrupts.
8930 !
9000 S=SPOLL(G9)
9010 STATUS 7,1 ; S0
9020 IF FLAG(1) THEN 9050 ! The program started with SRQ set.
9030 IF S>63 THEN 9070 !          3F hex
9040 DISP "Bad interrupt ";
9050 GOSUB 9600
9060 ENABLE INTR 7;8 @ RETURN
9070 GOSUB 9400
9080 CFLAG 2
9090 ENABLE INTR 7;8 @ RETURN
9100 !
9400 IF S<96 THEN RETURN !        60 hex
9410 IF S>111 THEN 9450 !         6F hex
9420 OUTPUT G9 ;"ERR?"
9430 ENTER G9 ; E$
9440 DISP "UNKNOWN STRING IS: ";E$
9450 GOSUB 9600
9460 STOP
9470 !
9490 ! Normally you would not do a return if there is a syntax
9500 !  error. Use STOP as in 9460, correct the error,
9510 !  and re-run the program.
9520 !
9600 W=S DIV 16 !  Convert decimal status to hex for display.
9610 F=S MOD 16
9620 S=W*10+F
9630 IF F>9 THEN GOTO 9660
9640 DISP S
9650 RETURN
9660 N$[1,1]=VAL$(W)
9670 F=F-9
9680 N$[2,2]=C$[F,F]
9690 DISP N$
9700 RETURN
9710 !
9800 DISP "GPIB timeout. Strike CONT to resume."
9810 PAUSE
9820 RESET 7 @ RETURN
9999 END
```

old Manual 11/86

MODEL 3100A

PROGRAMMABLE TRANSMISSION/AUDIO

TEST SYSTEM

OPERATOR'S MANUAL

Sound Technology
1400 Dell Avenue
Campbell, CA 95008
U.S.A.
Telephone: (408) 378-6540
Telex: 357445

Manual Part Number: 7900-0048
Manual printed in U.S.A.

Price: $20.00

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SECTION 1

OPERATIONAL CHARACTERISTICS

1-1 GENERAL

The 3100A Generator is a programmable audio oscillator with the capability of generating sinewaves, squarewaves, intermodulation distortion test signals, toneburst and sine/step waveforms. The output of the oscillator is two channel, electronically balanced and completely floating.

The 3100A Generator can be operated in a manual mode, via front panel programmability, or by remote control with an external computer. The manual mode is operated by usage of the buttons on the front panel. The front panel programmability mode is operated by using the front panel controls to store various test sequences into non-volatile memory (no external computer or knowledge of software necessary). The 3100A Generator can also be operated under remote control mode via RS232 bus or GPIB (General Purpose Interface Bus) by any suitable computer (i.e., I.B.M. P.C., A.T., X.T.; Apple II, MacIntosh; H.P. 80 Series; etc.).

The 3100A Generator may be used with the Sound Technology 1510A Tape Recorder/ Audio Test System, the Sound Technology 1530A MTS/Stereo Television Test System, the Sound Technology 3200A Programmable Audio Analyzer, with other analyzers, or as a stand-alone signal source. The 3100A Generator can also be used to operate the Sound Technology Model 3200A Analyzer under remote control via Frequency Shift Keying techniques.

1-2 SPECIFICATIONS

A. SINEWAVE, TONEBURST, SINE/STEP

Frequency Range	10 Hz to 102.39 kHz Frequencies of 1 Hz to 9.9 Hz can be used in Fixed Parameter mode after initial usage of oscillator.
Frequency Resolution	.01% 10 Hz to 102.39 kHz
Frequency Accuracy	.03% FIXED PARAMETERS .1% Automatic Sweep
Frequency Sweep	User selectable 4 to 255 points/decade, internally calculated to provide linear increments on a log-frequency scale; start and stop frequencies selectable over entire range. Sweep direction determined by selection of start and stop frequencies.
Level Sweep	User selected end points in dBm (600 or 150). dB/STEP keyed-in .05 dB to 20.00 dB. Sweep direction determined by selection of start and stop frequencies.

B. SQUAREWAVE

Frequency Range	1 Hz to 50 kHz
Risetime	less than 1 microsecond, controlled by 3-pole linear-phase filter.

C. TONEBURST

Frequency Range	100 Hz to 102.39 kHz
Time On Adjustment	10 milliseconds to 10 seconds
Toneburst Off Adjustment	Burst offtime attenuation from 5 to 60 dB in 5 dB increments

D. SINE/STEP

Frequency Range	100 Hz to 102.39 kHz
Sine On Adjustment	10 milliseconds to 10 seconds
Step On Adjustment	10 milliseconds to 10 seconds

E. SMPTE IMD

IMD Residual Distortion	less than .001%

F. GENERAL

Maximum Output Balanced or Unbalanced (one side grounded)	30.65 dBm/600 ohm load 30.00 dBm/600 ohms, both channels loaded 30.00 dBm/150 ohm load 24.00 dBm/150 ohms, both channels loaded
Maximum Open Circuit Voltage	28.6 V
Minimum Level	-90 dBm (24.5 microVolts)
THD at Maximum Output	less than .001% 10 Hz to 10 kHz less than .0013% to 20 kHz .01% to 100 kHz
Flatness	.1dB 10 Hz to 20 kHz .15 dB to 100 kHz
Level Accuracy	.2 dB at mid-band
Level Resolution	.05 dB

Source Resistance Tolerance	+ .5% (-0.35% both channels loaded) with 600 ohms ∓ 2% (-5.6% both channels loaded) with 150 ohms ± 3% with 50 ohms
Selectable Load Resistance	Key-in 50 ohms to 99,999 kohms
Balance	greater than 120 dB; floating, DC coupled
Separation	greater than 120 dB at 100 kHz
Sync Output	5V positive going squarewave. Follows Lo Freq on IMD and Burst Envelope on Burst or Sine/Step.
De-Emphasis	75 microseconds, 25 microseconds, 50 microseconds, or 10 microseconds. Applies to all functions including IMD
De-Emphasis Accuracy	.02 dB
De-Emphasis Resolution	.05 dB (Attenuator resolution)

1-3 FRONT PANEL FAMILIARIZATION

The front panel of the 3100A can be best understood by dividing the panel into 9 functional areas:

1. PROGRAMMING GROUP: Allows user to program front panel, recall stored programs, print contents of front panel memory and communicate with 3200A Analyzer via frequency shift keying techniques.

2. WAVEFORM GROUP: Allows user to select type of waveform (sinewave, squarewave, SMPTE intermodulation test signal, toneburst and sine/step) to be generated.

3. TEST MODE SELECT: Allows user to select either fixed parameter signal, frequency sweep or a level sweep. The auto sequence LED located in this section is only activated via usage of functions within the Programming Section.

4. PARAMETER GROUP: Allows user to select fixed frequency and level, duration, load resistance, sweep start and stop parameters, dB/step or points/decade for sweeps, separate sweep time multipliers, burst and sine/step configuration.

5. OUTPUT CONFIGURATION: Allows user to select source resistance, channel(s) to be output, de-emphasis, repeat test and test start and stop.

6. CALIBRATE/RESET: Allows user to periodically recalibrate frequencies to .01% resolution, reset certain functions in front panel memory and recalibrate fixed frequencies stored in front panel memory.

7. KEYPAD: Allows user to input various signal parameters and programming data.

8. DISPLAY SECTION: Allows user to review programming input and configuration of signals being output during testing.

9. OUTPUT CONNECTORS: Two channel balanced outputs, sync connector and power switch.

Figure 1 details the division of the front panel into these functional areas. Please take a few minutes to familiarize yourself with the front panel.

1-4 REAR PANEL CONNECTORS

A. AC POWER INPUT, FUSE, VOLTAGE SELECT CONNECTOR: This multi-purpose device is located at the upper right side of the rear panel. When the power cord supplied with the 3100A Generator is inserted in the connector, a sliding plastic cover will protect the fuse and the voltage changing section of the connector. If the power cord is removed, the plastic cover can be moved to expose the fuse. TO CHANGE THE FUSE OR INPUT VOLTAGE: Lift up on the handle labeled "FUSE PULL" to release the fuse. Insert a new fuse (1.5A, 250V, slo-blo). To change the voltage select PC board: use a small hook or wire to slowly pull out the small PC board located just under the fuse. Note that as the PC board is being removed, one of the voltages etched on the board (100, 120, 220, 240) is visible and "right side up" (the same way as "Fuse Pull"). Turn the PC Board and reinsert it so the operating line voltage is visible in exactly the same manner as when the board was first removed from the connector. When the board is fully inserted, replace the fuse and slide the plastic cover back over the fuse section. Replace the line cord.

B. IEEE-488 CONNECTOR AND ADDRESS SWITCH: This is an optional connector and switch used to connect the 3100A Generator to the General Purpose Interface Bus (GPIB) as defined in the IEEE-488 Standard. Further details are contained in Section 6 of this manual. This port is only installed if the 3100A Generator was purchased with the optional G.P.I.B.

C. PARALLEL PRINTER PORT: This is the connector used to connect the 3100A Generator to standard computer printers.

D. RS232 PORT: This is the connector used to connect the 3100A Generator to the RS232 bus. Further details are contained in Section 6 of this manual.

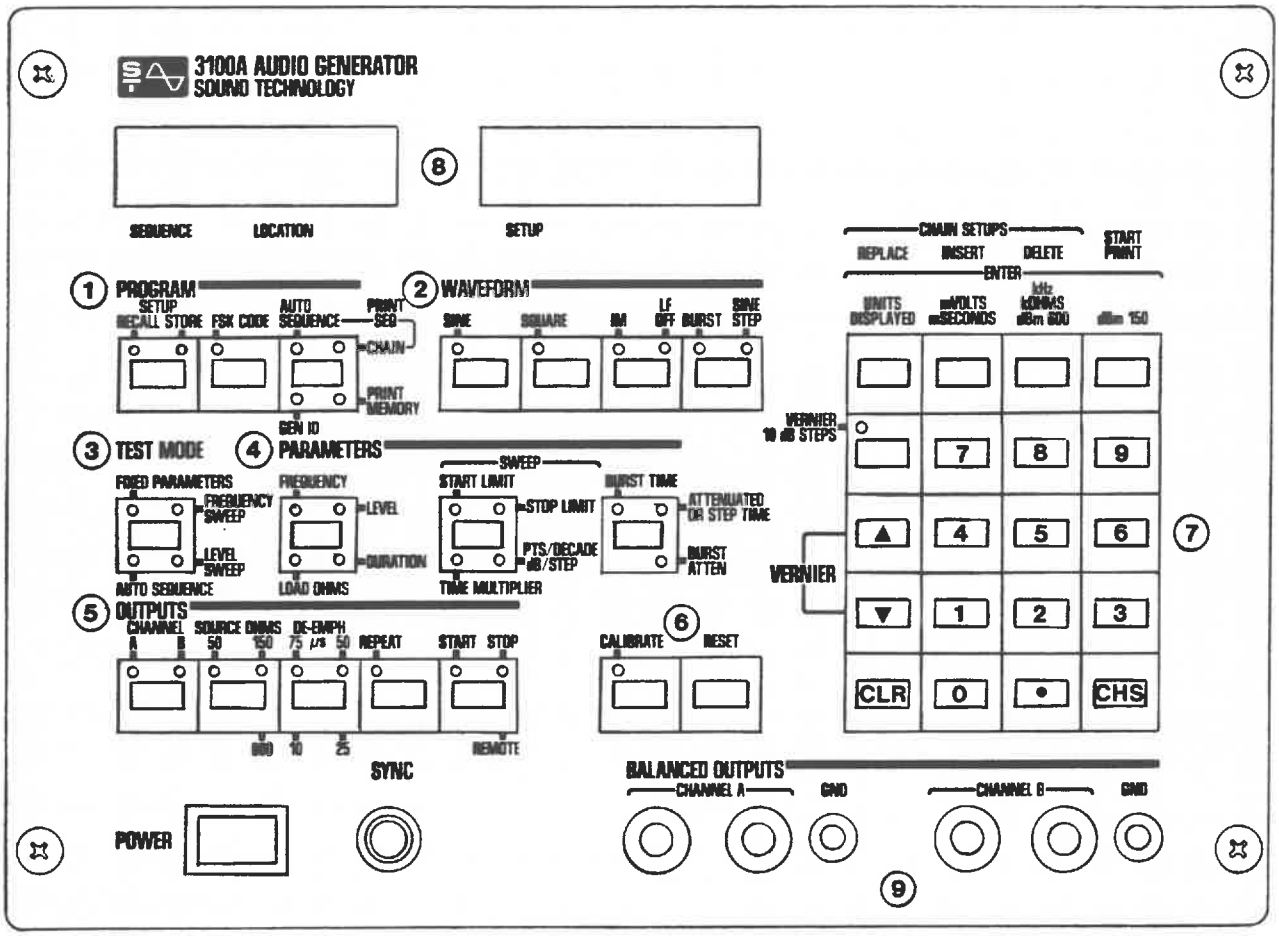


Figure 1. 3100A Generator Front Panel

SECTION 2

OPERATOR FAMILIARIZATION

2-1 GENERAL

This section of the manual is designed to give a new operator a quick familiarization with the 3100A Generator's operation. The steps should be followed in the order given, as many of them are sequence-dependant. Please note that the LED labels and buttons are in capital letters.

By various keypad operations the 3100A Generator can be used to generate a single fixed parameter signal, a frequency or level sweep, and a sequence of any combination of fixed parameter signals, frequency sweeps and/or level sweeps.

Please note that the 3100A Generator can be purchased in various configurations, dependent upon the options purchased. An instrument purchased without any options will not have De-emphasis, IMD, Toneburst or Sine/Step tests available. The lack of an option will be evident when the appropriate button is pushed and the LED does not light. All of these options may be purchased later and field-installed into your unit. Please contact Sound Technology, Inc. for more information.

The remainder of this Section of the manual details general procedures and detailed examples of outputting various test signals. We recommend that the first time user read this Section with a 3100A Generator in front of him, connected to a two channel oscilloscope. Connect the A Channel output of the 3100A Generator to the oscilloscope input. The waveforms (especially Toneburst and Sine/Step) are much easier to visualize with the usage of the oscilloscope. If both channels A and B are connected to a two channel scope, make sure the ground sides are both connected facing the same direction (either left or right). Both outputs share the same power amplifier, so grounding the left side of A Channel output and the right side of B Channel output, or vice versa, will short the amplifier output. The amplifier is protected for an indefinate short on its output, but you will lose the signal.

2-2 OUTPUTTING A FIXED PARAMETER FREQUENCY

The 3100A is designed to provide the maximum possible flexibility in determining the type of signal to be generated by usage of front panel controls. The recommended procedure for generation of a fixed frequency signal is as follows:

A. Turn Power Switch on.

B. Select Output Configuration (Channel A, Channel B, or Both).

C. Select Source Termination (50 ohms, 150 ohms, or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select a Waveform (Sine, Square, IM, Burst, or Sine/Step). Additional details on usage of Burst and Sine/Step Waveforms are in Section 2-5 and 2-6.

G. Select a Frequency (10 Hz to 102.39 kHz for Sine; 100 Hz to 102.39 kHz for Sine/Step or Burst; 10 Hz to 50 kHz for Square; frequencies are predetermined for SMPTE IM). Frequencies of 1 Hz to 9.9 Hz can be used for Sine, Burst or Square after initial operation of oscillator.

H. Select Level (maximum range of .0245 milliVolts to 28.43V; dependant on load and source impedance) and units of measure (V, milliVolts, dBm 150 or dBm 600).

I. Start test.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100A Generator. The example results in the generation of a 1 kHz Sinewave being output on two channels at 0 dBm 600. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUTS Group and the CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are both lit.

C. Select your Source Termination. Locate the OUTPUTS Group and the SOURCE OHMS Selection button. Press the SOURCE OHMS until the 50 LED is lit.

D. Select your Load Impedance. Locate the PARAMETERS Group and the button with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOHMS/dBm600 keyboard buttons. Notice that "1000.0 kOhm" will be displayed on the right display.

E. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select a Waveform. Locate the SINE LED within the WAVEFORM Group. Press the button and the SINE LED will light.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED. Press the button until the FREQUENCY LED is lit. Go to the keyboard and press the "1" and kHz/kOHMS/dBm 600 buttons in the keyboard. Notice the "1.0000 kHz" will be displayed on the right display. The generator has now been programmed to output a 1 kHz signal.

H. Select the Signal Level. Locate the PARAMETERS Group and the LEVEL LED. Press the button until the LEVEL LED is lit. Go to the keyboard and press the "0" and the kHz/kOhms/dBm 600 buttons. Notice that the left display will indicate "0.00 dBm 600." The generator has now been programmed to output a 0 dBm 600 signal.

I. Start the Output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate "1.0000 kHz." The left display will indicate "0.00 dBm 600." Now a continuous signal is being generated until you press the TEST START button again (and the LED registers TEST STOP).

2-3 OUTPUTTING A FREQUENCY SWEEP

The recommended procedure for generation of a frequency sweep is as follows:

A. Turn Power Switch on.

B. Select the Output configuration (Channel A, Channel B, or Channels A and B), Source Impedance (50 ohms, 150 ohms, or 600 ohms) and Load Impedance (50 ohms to 99,999 kOhms).

C. Select Frequency Sweep test mode.

D. Select Level (.0245 milliVolts to 28.43V; dependant on load and source impedance) and unit of measure (milliVolts, V, dBm 150 or dBm 600).

E. Select Starting Frequency (10 Hz to 102.39 kHz) and Stopping Frequency (10 Hz to 102.39 kHz). This determines the direction of the sweep.

F. Select the number of Points per Decade (4 to 255).

G. Select the Speed of the sweep (fastest sweep = 1; slowest sweep = 999).

H. Select De-emphasis (none, 75 microseconds, 50 microseconds, 25 microseconds, or 10 microseconds) (De-emphasis is purchased as an option on the 3100A Generator and may not be available on your unit).

I. Select either a Single Sweep or a Repeating Sweep.

J. Start the Sweep.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100A Generator. The example results in the generation of a 10 Hz to 100 kHz frequency sweep with 10 points per decade and 75 microsecond De-emphasis at a 0 dBm 600 level. The sweep will be performed at 1/6 of fastest sweep time available and be output on two channels. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUTS Group and the CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are both lit.

C. Select your Source Termination. Locate the OUTPUTS Group and the SOURCE OHMS Selection button. Press the SOURCE OHMS until the 50 LED is lit.

D. Select your Load Impedance. Locate the PARAMETERS Group and the button with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 keyboard buttons. Notice that "1000.0 kOhm" will be displayed on the right display.

E. Locate the TEST MODE button. Press the button until the FREQUENCY SWEEP LED is lit. Please note that the SINE LED will light as SINE is automatically selected. Frequency sweeps are only available with the Sine waveform.

F. Select the Signal Level. Locate the PARAMETERS Group and the LEVEL LED. Press the button until the LEVEL LED is lit. Go to the keyboard and press the "0" and the kHz/kOhms/dBm 600 keyboard buttons. Notice that the left display will indicate "0.00 dBm 600." The generator has now been programmed to output a 0 dBm 600 signal.

G. Select the starting and stopping frequencies for the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the START LED is lit. Press the "1", "0" and UNITS DISPLAYED buttons on the keyboard. The right display will indicate "10.000 Hz." Press the SWEEP button in the PARAMETERS Group until the STOP LED is lit. Press the "1", "0", "0" and kHz/kOhms/dBm 600 buttons in the keyboard. The right display will indicate "100.00 kHz." You can sweep from high to low frequency or from low to high frequency.

H. Select the number of points per decade. Locate the SWEEP button in the PARAMETERS Group. Press the button until the PTS/DECADE LED is lit. Press the "1", "0" and UNITS DISPLAYED buttons on the keyboard. The right display will indicate "10 P/D."

I. Select the speed of the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the SWEEP TIME MULTIPLIER LED is lit. Press the "6" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "6."

J. Select the De-emphasis. Locate the DE-EMPH button in the OUTPUTS Group. Press the button until the 75 microseconds LED is lit. (The De-emphasis function is optional on the 3100A Generator. Please check the lower left corner of the rear panel of your unit to locate the option tag. If the tag lists Option 006, your unit includes the De-emphasis function. If your unit does not have the De-emphasis function, skip this step and go on to the next one).

K. Select either a single sweep or a repeating sweep. Locate the button with the REPEAT LED indicator in the OUTPUT Group. Press the button until the REPEAT LED is not lit.

L. Start the output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate what frequency is being output. The left display will indicate the level of the signal. The sweep will take approximately 7 seconds.

The 3100A Generator will retain in memory the last fixed parameter frequency setting used. If you use a function which accesses the displays (i.e., LEVEL LED or LOAD OHMS LED) the last fixed frequency used will be indicated on the right display.

2-4 OUTPUTTING A LEVEL SWEEP

The recommended procedure for generation of a level sweep is as follows:

A. Turn Power Switch on.

B. Select the Output Configuration (A Channel, B Channel, or A Channel and B Channel), Load Impedance (50 ohms to 99,999 kOhms) and Source Termination (50 ohms, 150 ohms, or 600 ohms).

C. Select Level Sweep mode.

D. Select Frequency (10 Hz to 102.39 kHz) or intermodulation signal waveform (low frequency on or off). Frequencies of 1 Hz to 9.9 Hz can be selected after initial operation of oscillator.

E. Select Starting Level (maximum range of -90 dBm 600 to 30.65 dBm 600, dependant upon load and source impedance) and unit of measure (dBm 150 or dBm 600).

F. Select Stopping Level (maximum range of -90 dBm 600 to 30.65 dBm 600, dependant upon load and source impedance) and unit of measure (dBm 150 or dBm 600).

G. Select the Resolution of sweep (.05 dB/Step to 20 dB/Step).

H. Select the Speed of the sweep (fastest sweep = 1; slowest sweep = 999).

I. Select Single or Repeating sweep. **IMPORTANT** Do not allow the 3100A Generator to continously output level sweeps for a long period of time. It is possible to leave the 3100A in REPEAT sweep condition and wear out the output attenuator relays. Although the relay has an estimated life in excess of one million operations, it is possible to perform more than 100 sweeps per minute if the 3100A Generator is allowed to remain in a REPEAT sweep condition.

J. Start the sweep.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100A Generator. The example results in the generation of a repeating -12 dBm 600 to 12 dBm 600 level sweep with 2.00 dB per step at 400 Hz. The sweep will be output at 1/6 of the fastest sweep time available and be output on two channels. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUT Group and CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are lit. Select your Source Termination. Locate the SOURCE OHMS button in the OUTPUTS Group. Press the SOURCE OHMS until the 50 LED is lit. Select your Load Impedance. Locate the LOAD OHMS LED in the PARAMETERS Group. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 keyboard buttons. Notice that the "1000.0 kOhms" will be displayed on the right display.

C. Press the TEST MODE button until the LEVEL SWEEP LED is lit.

D. Select the frequency by pressing the button in the PARAMETERS Group until the FREQUENCY LED is lit. Press the "4", "0", "0" and UNITS DISPLAYED buttons on the keyboard (400 Hz). The right display will indicate "400.00 Hz."

E. Select the starting level. Locate the SWEEP button in the PARAMETERS Group. Press the button until the START LED is lit. Press the "1", "2", "CHS" (change signs) and kHz/kOhms/dBm 600 buttons on the keyboard. The left display will indicate "-12.00 dBm 600."

F. Select the stopping level. Press the SWEEP button until the STOP LED is lit. Press "1", "2" and kHz/kOhms/dBm 600 buttons on the keyboard. The left display will indicate "12.00 dBm 600."

G. Select the resolution for the level sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the dB/STEP LED is lit. Press the "2" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "02.00 dB."

H. Select the speed of the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the SWEEP TIME MULTIPLIER LED is lit. Press the "6" and UNITS DISPLAYED buttons on the keyboard. The left display will indicate "6."

I. Select either a single sweep or a repeating sweep. Locate the button with the REPEAT LED indicator. Press the button until the REPEAT LED is lit.

J. Start the output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate what frequency is being output. The left display will indicate the level being output. The sweep will take approximately 2 seconds. The sweep will continue until the TEST STOP button is pressed.

The 3100A Generator will retain in memory the last fixed parameter level setting used. If you use a function which accesses the displays (i.e., FREQUENCY LED or LOAD OHMS LED) the last fixed parameter level will be indicated on the left display.

2-5 OUTPUTTING A TONEBURST WAVEFORM

The Toneburst waveform is optional on the 3100A Generator. Please check the lower left corner of the rear panel of your unit to locate the option tag. If the option tag lists Option 005, your

unit has the capability of Toneburst.

The 3100A Generator allows the user to output a toneburst with a user-selected frequency, user-selected burst time on, user-selected burst time off, and user-selected burst-off attenuation levels. The different characteristics of the toneburst are as follows:

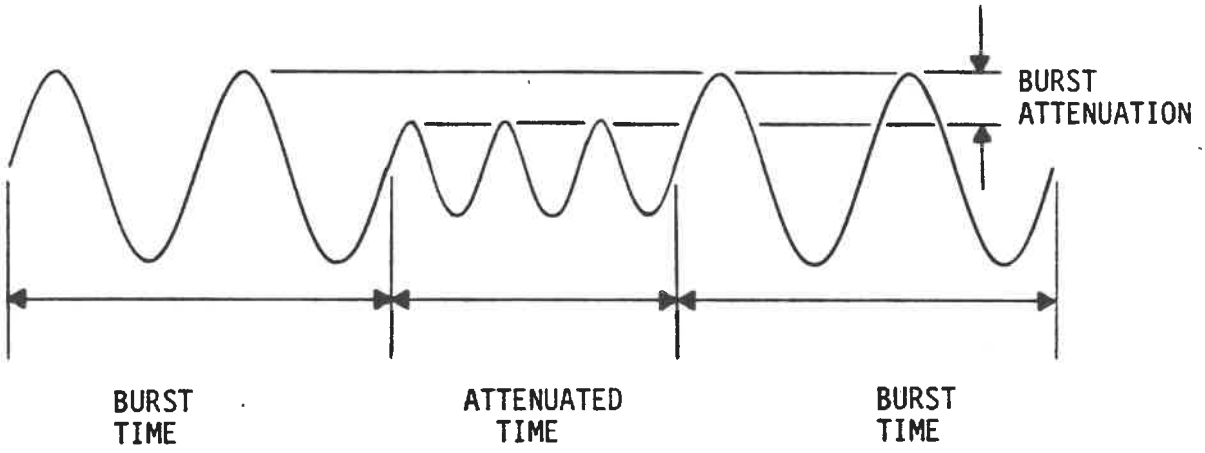


Figure 2. Toneburst Waveform

The recommended procedure for generation of a Toneburst is as follows:

A. Turn Power Switch on.

B. Select Output Configuration (A Channel, B Channel or A and B Channels).

C. Select Source Termination (50 ohms, 150 ohms, or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select the Burst waveform. (Burst is purchased as an option on the 3100A Generator and may not be available on your unit).

G. Select a Frequency (100 Hz to 102.39 kHz).

H. Select a Level (maximum range of .0245 milliVolts to 28.57V dependant on load and source impedance) and unit of measure (V, milliVolts, dBm 150 or dBm 600).

I. Select Burst Time on (10 milliseconds to 10 sec).

J. Select Burst Time off (10 milliseconds to 10 sec).

K. Select Burst Attenuation (5 dB to 60 dB in 5 dB increments).

L. Start Test.

To familiarize yourself with these procedures we recommend you input the following example into the 3100A Generator. Following the instructions for this example results in the generation of a series of 40 millisecond 1 kHz Tonebursts followed by 60 millisecond 20 dB attenuated signals. The Toneburst is being output on both channels at a burst level of 2V. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select Output Configuration. Press the Channel select button in the OUTPUTS Group until the A LED and B LED is lit.

C. Select Source Termination. Press the SOURCE OHMS button in the OUTPUTS Group until the 50 LED is lit.

D. Select Load Impedance. Locate the button in the PARAMETERS Group with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 button in the keyboard. Notice the right display will indicate "1000.0 kOhms."

E. Select Fixed Parameter test mode. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select Toneburst waveform. Locate the BURST LED in the WAVEFORM Group. Press button until the BURST LED is lit.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED. Press the button until the FREQUENCY LED is lit. Press the "1" and kHz/kOhms/dBm 600 buttons in the keyboard. Notice the right display will indicate "1.0000 kHz."

H. Select the Level. Locate the PARAMETERS Groups and the FREQUENCY LED. Press the button until the LEVEL LED is lit. Press the "2" and UNITS DISPLAYED buttons in the keyboard. Notice the left display will indicate "2.0000V."

I. Select Burst Time on. Locate the BURST TIME LED in the PARAMETERS Group. Press the button until the BURST TIME LED is lit. Press the "4", "0" and UNITS DISPLAYED (or milliVOLTS/mSECONDS) buttons in the keyboard. Notice the right display will indicate "40 ms."

J. Select Burst Time off. Press the same button as in I above until the ATTENUATED OR STEP TIME LED is lit. Press the "6", "0" and UNITS DISPLAYED (or milliVOLTS/mSECONDS) buttons in the keyboard. Notice the right display will indicate "60 ms."

K. Select Burst Attenuation. Press the same button as in J above until the BURST ATTN LED is lit. Press the "2", "0" and UNITS DISPLAYED buttons in the keyboard. Notice the left display will indicate "20 dB."

L. Start Output of Signal. Press the TEST button in the OUTPUTS Group until the START LED is lit.

2-6 OUTPUTTING A SINE/STEP WAVEFORM

The Sine/Step waveform is optional on the 3100A Generator. Please check the lower left corner of the rear panel of your unit to locate the option tag. If the option tag lists Option 005, your unit has the capability of generating Sine/Step signals.

The 3100A Generator allows the user to output a sinewave burst followed by a D.C. step signal equal to the peak amplitude of the sinewave. The user selects frequency, duration of sine-

wave and duration of D.C. step signal. This waveform allows the user to analyze the effects of time delay distortion in steep slope low pass filters. The sinewave burst will accumulate maximum time delay while the D.C. step signal will accumulate minimal time delay. This test signal is used to detect problems resulting from the sinewave coinciding with the beginning of the DC step signal at the filter's output (overshoot). This test signal is also useful as a polarity test within a balanced system.

The different characteristics of the Sine/Step waveform are as follows:

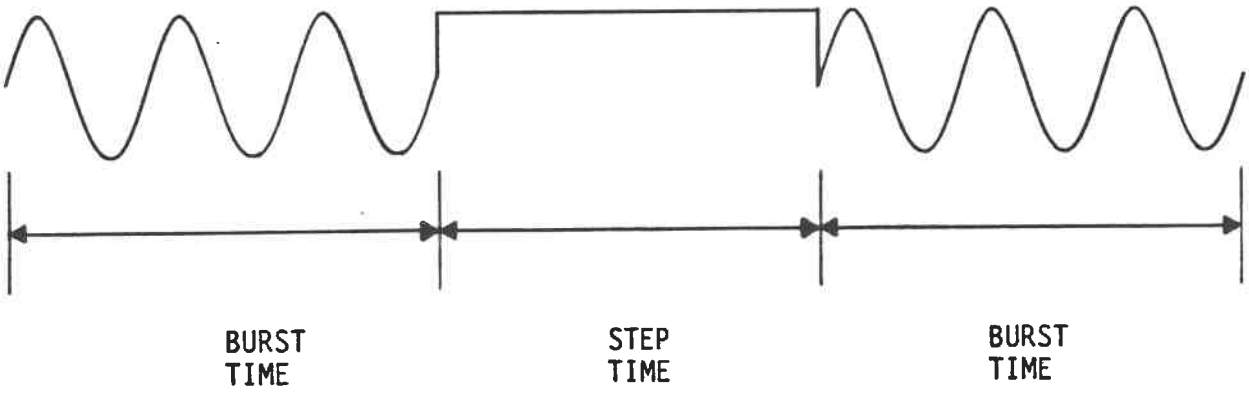


Figure 3. Sine/Step Waveform

The recommended procedure for generation of a Sine/Step waveform is as follows:

A. Turn Power Switch on.

B. Select Output Configuration. (A Channel, B Channel or A and B Channels).

C. Select Source Termination (50 ohms, 150 ohms or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select the Sine/Step waveform.

G. Select a Frequency (100 Hz to 102.39 kHz).

H. Select a Level (maximum range of .0245 milliVolts to 28.57V dependant on load and source impedance) and unit of measure (milliVolts, V, dBm 150 or dBm 600).

I. Select Duration of Sinewave (10 milliseconds to 10 sec).

J. Select Duration of D.C. step signal (10 milliseconds to 10 sec).

K. Start Test.

To familiarize yourself with these procedures we recommend you input the following example into the 3100A Generator. The example results in the generation of a series of 40 millisecond 5 kHz Sinewaves followed by 80 millisecond D.C. step signals. The Sine/Step is being output on two channels at a 2V level. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select Output Configuration. Press the Channel select button in the OUTPUTS Group until the A LED and B LED is lit.

C. Select Source Termination. Press the SOURCE OHMS button in the OUTPUTS Group until the 50 LED is lit.

D. Select Load Impedance. Locate the button in the PARAMETERS Group with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 button in the keyboard. Notice the right display will indicate "1000.0 kOhms."

E. Select Fixed Parameter test mode. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select Sine/Step waveform. Locate the SINE STEP LED in the WAVEFORM Group. Press button until the SINE STEP LED is lit.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED. Press the button until the FREQUENCY LED is lit. Press the "1" and "kHz" buttons in the keyboard. Notice the right display will indicate "1.0000 kHz."

H. Select the Level. Press the same button in the PARAMETERS Group as in G above until the LEVEL LED is lit. Press the "2" and UNITS DISPLAYED buttons in the keyboard. Notice the left display will indicate "2.0000V."

I. Select Duration of Sinewave. Locate the BURST TIME LED in the PARAMETERS Group. Press the button until the BURST TIME LED is lit. Press the "4", "0", and UNITS DISPLAYED (or milliVOLTS/milliSECONDS) buttons in the keyboard. Notice the right display will indicate "40 ms."

J. Select Duration of D.C. offset. Press the same button as in I above until the STEP TIME LED is lit. Press the "6", "0", and UNITS DISPLAYED (or milliVOLTS/milliSECONDS) buttons in the keyboard. Notice the right display will indicate "60 ms."

K. Start Output of Signal. Press the TEST button in the OUTPUTS Group until the START LED is lit.

2-7 USE OF VERNIER

The 3100A Generator has the capability of adjusting an entered frequency or level parameter by using a built in vernier. Located in the keyboard section there is a button with a VERNIER/10dB STEPS LED. When this LED is NOT lit, the user may adjust the previously entered frequency or level either up or down by pressing one of the two VERNIER buttons in the keyboard while the 10dB STEP LED is NOT lit. The usage of the VERNIER button eliminates the need to enter a new frequency

or level on the keyboard.

The vernier allows the user to adjust the frequency of sinewaves and squarewaves. The frequency vernier can be accessed whenever the 3100A Generator is in FIXED PARAMETER or LEVEL SWEEP mode and the FREQUENCY LED is lit. To operate the vernier, press either of the VERNIER buttons in the keyboard. The changes in frequency are indicated in the right display.

The level vernier can be used with any waveform. The level vernier can be accessed whenever the 3100A Generator is in FIXED PARAMETER or FREQUENCY SWEEP test mode and the LEVEL LED is lit. To operate the vernier, press either of the VERNIER buttons in the keyboard. The changes in level are indicated in the left display.

2-8 USE OF 10dB STEP FUNCTION

The 3100A has the capability of automatically adjusting the previously entered level by 10dB increments by pressing a button. The 3100A Generator will automatically adjust the level settings in any unit of measure. The 3100A Generator will accept level settings in Volts, milliVolts, dBm 150 or dBm 600. The 10dB STEP function can be used with any waveform. The 10dB STEP function can be accessed whenever the 3100A Generator is in FIXED PARAMETER or FREQUENCY SWEEP test mode and the LEVEL LED is lit. Within the keyboard section of the 3100A Generator there is a button with a VERNIER/10dB STEP LED. When the LED is lit, the 10dB STEP function is available. When the LED is not lit, the VERNIER function is available. To operate the 10dB STEP function, press either of the VERNIER buttons in the keyboard. The change in level will be indicated in the left display.

SECTION 3

FRONT PANEL PROGRAMMABILITY

3-1 GENERAL

The 3100A Generator may be programmed by using the built-in memory and front panel controls. No external computer or controller is needed, the only necessary component is the 3100A Generator. The programming requires no prior knowledge of programming or software languages. With a few keyboard entries, up to 80 fixed parameter waveforms, frequency sweeps or level sweeps, can be stored into memory. Any of these memory positions can then be linked together into as many as 16 auto-sequence chains, each chain consisting of up to 80 fixed parameters and/or sweeps.

The front panel programmability allows usage of all of the capabilities of the 3100A Generator. Any signals that can be generated by using the front panel controls may also be stored and used as a preprogrammed signal. With the exception of Toneburst and Sine/Step waveforms, any of the preprogrammed signals can then be linked into auto-sequences. (If the Toneburst and Sine/Step waveforms are included in an auto-sequence, the 3100A Generator will skip the waveform and continue the auto-sequence). The linked signals are assigned a two-digit code and recalled by entry of this code. For example, a sequence of a combination of up to 80 frequency sweeps, level sweeps, fixed frequency or fixed level signals can be run by entering the assigned two-digit code and pressing START TEST. The user can stipulate all of the normal parameters (i.e., frequency, level, sweep start and stop limits, output configuration, points per decade, signal duration, etc.) for each of the 80 front panel set-ups. The user has the ability to devise and run elaborate test procedures with minimal entry.

3-2 STORING A FRONT PANEL SET-UP

The procedure for storing a front panel set-up involves setting-up the Generator front panel for the desired signal exactly as you would do in the manual mode (see Section 2 of this manual), inputting an operation code, assigning a memory location number (1 through 80), and storing the panel set-up.

The operation code is a ten-digit number utilized for remote control of the Sound Technology Model 3200A Audio Analyzer or the two keystroke entry of "00000", "10000" can be used if the 3100A Generator is not communicating with the 3200A Analyzer. The control of the 3200A Analyzer is accomplished via a series of coded frequency bursts transmitted through the audio path being tested. This technique is referred to as frequency shift keying, or "FSK."

The operation code allows the user of the 3100A Generator to determine which type of measurement will be made by the 3200A Analzyer, which filters to be used, detection method, units of measure, print function, and input configuration. If the 3100A Generator is not being used with the 3200A Analyzer, entry of an operation code is still necessary for control of the

3100A Generator. If the 3100A Generator is being used without the 3200A Analyzer, any non-zero operation code is all that is necessary.

Assuming the 3100A Generator is being used without utilizing remote control of the 3200A Analyzer, the method of storing a frequency sweep would be as follows:

A. Set-up the front panel buttons as you would to output a frequency sweep. Follow the instructions in paragraph 2-3, pages 8 and 9, up to step L.

B. Press the TEST MODE button until the FREQUENCY SWEEP LED is lit.

C. Press the button in the PROGRAM Group until the FSK LED is lit.

D. Press the "0" and UNITS DISPLAYED buttons in the keyboard. The left display will indicate "00000." Press the "1" and UNITS DISPLAYED buttons in the keyboard. The right display will indicate "10000." The operation code "0000010000" is now associated with this front panel set-up.

E. Locate the PROGRAM SETUP button in the PROGRAM Group. Press the button until the STORE LED is lit.

F. Press the "1" button and UNITS DISPLAYED in the keyboard. The left display will indicate "1." The frequency sweep is now stored in memory position 1.

For a detailed explanation of the usage of operation codes for remote control of the 3200A Analyzer, please refer to Section 4 of this manual.

The same procedure is followed for storing a fixed parameter signal except that the duration of the signal must also be specified. Setting the duration does not apply to normal manual operation of the 3100A Generator. During manual use, a fixed signal is constantly output until the STOP button is pressed. It is necessary to define duration of the signal since the front panel set-up may be used in an auto-sequence of front panel set-ups. The procedure for storing a fixed parameter front panel set-up is to set up the Generator front panel for the desired signal exactly as you would in the manual mode (see paragraph 2-2, 2-5 and 2-6), selecting duration time (5 milliseconds to 10 sec), inputting an operation code, assigning a memory location number (1 through 80), and storing the front panel set-up. For example, to store a fixed parameter signal, follow the instructions in paragraph 2-2, page 7, up to step I. Then:

A. Locate the DURATION LED in the PARAMETERS Group. Press the button until the DURATION LED is lit. Press the "1", "0", "0", "0" and UNITS DISPLAYED buttons in the keyboard. Notice the right display indicates "1000 ms."

B. Press the button in the PROGRAM Group until the FSK LED is lit.

C. Press the "0" and UNITS DISPLAYED buttons in the keyboard. The left display will indicate "00000. Press the "1" and UNITS DISPLAYED buttons in the keyboard. The right display will indicate "10000." The operation code "0000010000" is now associated with this front panel set-up.

D. Locate the PROGRAM SETUP button in the PROGRAM Group. Press the button until the STORE LED is lit.

E. Press the "2" and UNITS DISPLAYED buttons in the keyboard. The left display will indicate "2." Now this fixed parameter signal is stored in memory position 2.

The same procedure can be followed to store up to 80 different front panel set-ups. Appendix One contains an example of a worksheet format which can be used to plan what types of signals will be entered into front panel set-ups.

3-3 RUNNING A FRONT PANEL SET-UP

The procedure for running one of the previously stored front panel set-ups is to recall the set-up and start the signal. All stored front panel set-ups can be reviewed by viewing the LEDs and displays on the front panel or by printing the panel set-ups via a standard computer printer (see Section 3-7). For example, to review and run the front panel set-ups you have stored in paragraph E of Section 3-2 above:

A. Locate the PROGRAM SETUP button in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "1" button and UNITS DISPLAYED on the keyboard. The front panel will have the same LEDs lit as when you input the original front panel set-up. By reviewing the lit LEDs and the two displays you have the complete configuration of the stored panel set-up in the number 1 memory position. Press the "2" button and UNITS DISPLAYED on the keyboard. The front panel will have the same LEDs lit as when you input the original front panel set-up number 2. By reviewing the lit LEDs and the two displays, you have the complete configuration of the stored panel set-up in number 2 memory position. You may wish to display the load impedance in the stored panel by pressing the LOAD OHMS button in the PARAMETERS Group to display the load impedance in the right display.

If you try to RECALL a front panel set-up which is not in memory, the left display will indicate "- - -."

C. To start the signal, press the START button in the OUTPUTS Group until the START LED is lit. Whatever front panel set-up has been recalled from memory will define the signal generated.

3-4 MODIFYING A FRONT PANEL SET-UP STORED IN MEMORY

The procedure for modifying a front panel set-up currently in memory involves recalling the front panel set-up, inputting the desired revision, and storing the revised front panel set-up. It is essential that the front panel set-up is stored after revision or the revision will be ignored by the 3100A Generator.

Assuming you wish to modify the front panel set-up in memory position 7 to output a SQUARE waveform instead of a SINE waveform, the procedure would be as follows:

A. Locate the SETUP RECALL LED in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "4" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate the level and frequency of the signal of front panel set-up number 4. The LEDs will indicate the other characteristics of the signal stored in front panel set-up number 4.

C. Press the appropriate buttons to revise the signal as desired. In this example, press the SQUARE button in the WAVEFORM Group.

D. Locate the SETUP STORE LED in the PROGRAM Group. Press the button until the STORE LED is lit.

E. Press the "4" and UNITS DISPLAYED buttons in the keyboard. The revised front panel set-up is now stored in front panel set-up number 4 memory.

3-5 REPLACING OR DELETING A FRONT PANEL SET-UP

After storing a front panel set-up in memory the front panel set-up can be replaced by inputting a new front panel set-up into the same memory position. The procedure for replacing a front panel set-up is the same as the procedure to store a new front panel set-up.

To delete a front panel set-up from memory, the procedure is to recall the front panel set-up, change the FSK operation code to "0000000000", and store the front panel set-up.

Assuming you wish to delete front panel set-up number 26, the procedure would be as follows:

A. Locate the SETUP RECALL LED in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "2", "6" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate the level and frequency of the signal of front panel set-up number 26. The LEDs will indicate the other characteristics of the signal stored in front panel set-up number 26.

C. Press the FSK CODE button in the PROGRAM Group until the LED is lit.

D. Press the "0", UNITS DISPLAYED, "0" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate "00000" and "00000."

E. Locate the SETUP STORE LED in the PROGRAM Group. Press the button until the STORE LED is lit.

F. Press the "2", "6" and UNITS DISPLAYED buttons in the keyboard.

3-6 STORING AN AUTOMATED SEQUENCE

There are 16 memory locations available for storing auto-sequences of front panel set-ups. The front panel set-ups can be linked together in any sequence and a front panel set-up can be used multiple times in one auto-sequence. A front panel set-up can also be used in different auto-sequences. The 16 memory locations for auto-sequences are assigned the code numbers 1 through 16. The load resistance selected in the first front panel set-up encountered in the auto-sequence will be used in the entire remaining auto-sequence. In auto-sequences in memory positions 9 through 16, the level selected in the first front panel set-up encountered in the auto-sequence will be used in the entire remaining auto-sequence. These two automatic features allow the user to design extensive test sequences of a combination of up to 80 sweeps and/or fixed parameter signals which can be used at any desired load resistance or level. To change level or load resistance, the user can simply change level or load resistance in the first panel set-up of the auto-sequence. **IMPORTANT** If the auto-sequence is started at a point other than location one, the load impedance contained within the first front panel set-up encountered will determine load impedance for the remainder of the auto-sequence. If the auto-sequence numbers 9 through 16 are started at a point other than location one, the fixed parameter level setting contained within the first front panel set-up encountered will determine level setting for the remainder of the auto-sequence.

Another useful feature is available to suppress the transmission of FSK codes during an auto-sequence. As the 3100A Generator can be used with analyzers which do not have FSK capability, it may be desirable to eliminate the genera-

ation of frequency bursts used for FSK communication. By changing the first digit in the operation code to "0" in the first front panel set-up encountered while running an auto-sequence, no FSK codes will be transmitted by any front panel set-ups within the remaining auto-sequence.

While in the auto-sequence mode, the two displays of the 3100A Generator are divided into three, two-digit groups. To assist you in visualizing this, please locate the button in the PROGRAM Group with the AUTO SEQUENCE LED. Press the button until the AUTO SEQUENCE LED is lit. Please note that the AUTO SEQUENCE LED on the TEST MODE button automatically lights up and the displays now have three sets of two-digit numbers. The first two digits in the left display is the auto-sequence number (1 through 16) you are working with. The second two digits in the left display is the location within the auto-sequence (1 through 80) that you are working with. The two digits in the right display is the front panel set-up (1 through 80) that you are working with. Assuming the display readout is **04 02 08** you know that front panel set-up number 8 is the second test signal to be generated in auto-sequence number 4.

Although front panel set-ups using squarewave, toneburst and sine/step waveforms can be stored, they cannot be accessed through auto-sequences. If a front panel set-up utilizing one of these waveforms is included within an auto-sequence, the 3100A Generator will ignore this front panel set-up and continue to the next chained front panel set-up.

Front panel set-ups may be stored using repeating frequency and level sweeps. When a repeating sweep is encountered within an auto-sequence, the sweep will be performed one time. If the user desires repeating sweeps he may enter the desired front panel set-up numerous times within the auto-sequence.

The procedure to store an auto-sequence is to put the 3100A Generator into the auto-sequence mode, locate the desired auto-sequence number, put the 3100A Generator into chain sequence, and enter the front panel set-up number in whatever order the user desires.

To facilitate ease of entry and editing, the 3100A Generator uses the top row of buttons in the keyboard for various editing capabilities during the creation of auto-sequences or the editing of existing auto-sequences. Please note the buttons marked "REPLACE", "INSERT", and "DELETE" under the "CHAIN SETUPS" title.

An effective illustration of these procedures first requires that numerous front panel set-ups are stored in memory. We recommend you either have several front panel set-ups stored in memory or you store the following front panel set-ups into memory:

Front Panel Set-Up No.	Description	Analysis
1	1 kHz, +4 dBm/600 A&B channel, 10 sec	set ref. level
2	10 kHz, -16 dBm, A&B channel, 5 sec	phase error
3	15 kHz, -16 dBm, A&B channel, 5 sec	phase error
4	freq sweep, 20kHz-10Hz, 4pts/dec, A chan	channel sep
5	freq sweep, 20kHz-10Hz, 10pts/dec, 4x speed	frequency response
6	freq sweep, 20kHz-10Hz, 5pts/dec, 35x speed	freq vs dist (THD)
7	SMPTE IMD	IMD distortion
8	A&B channel terminated, 10 sec	signal/noise
9	freq sweep, 50usec de-emphasis	freq resp, STL
10	1kHz, +4 dBm/600 A&B channel, 10 sec	final level check

Assuming you want the auto-sequence to generate the above front panel set-ups in the following order: **1, 4, 5, 6, 2, 3, 7, 9, 8, 10,** the procedure to create the auto-sequence is:

A. Locate the AUTO SEQUENCE LED in the PROGRAM Group. Press the button until the AUTO SEQUENCE LED is lit. Note that the displays will show three, two-digit numbers.

B. Press the "1" and REPLACE buttons in the keyboard. The first two-digit group in the left display will by "01" indicating that you are working with auto-sequence number one.

C. Locate the CHAIN LED in the PROGRAM Group. Press the button until the CHAIN LED is lit.

D. Press the "up" VERNIER button once. The second two-digit group in the left display will indicate the location number you are working with within the auto-sequence. Pressing the "up" VERNIER advances the location within the auto-sequence by one position and pressing the "down" VERNIER decreases the location within the auto-sequence by one position. Use the VERNIER function until the display indicates that the second two-digit group is "01."

E. Press the "1" and REPLACE button in the keyboard. The right display will be "01" indicating that you are storing front panel set-up number 1 as the first signal to be generated in auto-sequence number 1.

F. The first front panel set-up encountered in the the auto-sequence will define the load impedance throughout the entire remaining auto-sequence. In auto-sequences 9 through 16, the level setting in the first front panel set-up encounterd in the auto-sequence will define the level setting throughout the entire remaining auto-sequence. All stored front panel set-ups have a fixed level associated with them, even level sweeps. The fixed level associated with a level sweep is the last fixed parameter level used in the 3100A Generator prior to the level sweep being stored in front panel memory.

G. Press the "up" VERNIER button once. The second two-digit group in the left display will be "02" indicating that you are working with the second location within the auto-sequence.

H. Press the "4" and REPLACE button in the keyboard. The right display will be "04" indicating that you are storing front panel set-up number 4. The three two-digit groups shown on the displays, **01 02 04,** indicates that front panel set-up 4 will be the second test signal to be generated in auto-sequence number 1.

I. Continue steps G & H for the remaining front panel set-ups that are to be included in auto-sequence number 1. Please note that there are 80 available locations in each auto-sequence.

J. If you wish to suppress the transmission of frequency bursts used in FSK communication, the first digit of the operation code in the first front panel set-up encountered when running the auto-sequence should be changed to "0". This will result in the suppression of all FSK signals during the entire remaining auto-sequence. It is necessary to retain one non-zero digit in the operation code to prevent deletion of the front panel set-up from memory. The suppression of FSK communication is highly recommended if the 3100A Generator is being used with an analyzer other than the 3200A Analyzer. The procedure to follow is to put the 3100A Generator into FIXED PARAMETER TEST MODE, press SETUP RECALL in PROGRAM Group, enter on the keyboard the front panel set-up number which is in the first location encountered when running your auto-sequence, press the FSK CODE button until the LED is lit, and enter on the keyboard the operation code "0000010000".

Press the SETUP STORE in PROGRAM Group followed by keyboard entry of desired front panel set-up number and UNITS DISPLAYED button. You have changed the FSK code and stored the change into memory. It is only necessary to change the first digit of the operation code to zero for suppression of FSK code transmission. Obviously, if the existing FSK code has a leading zero, no change is necessary to suppress FSK code transmission.

K. To determine if the front panel set-ups have been stored properly, press the "down" VERNIER button until the displays indicate **01 01 01**. By pressing the "up" VERNIER button you can review the auto-sequence of front panel set-ups. If the front panel set-ups have been stored correctly, the displays should be as follows:

01 01 01
01 02 04
01 03 05
01 04 06
01 05 02
01 06 03
01 07 07
01 08 09
01 09 08
01 10 10

The auto-sequences can be edited by usage of the REPLACE, INSERT, and DELETE keys in the keyboard. These keys are only functional when the CHAIN LED is lit. The REPLACE key will remove an existing front panel set-up from the auto-sequence and substitute whatever front panel set-up number that is then entered in the keyboard followed by pressing REPLACE. The INSERT key will allow the inserting of a front panel set-up between two existing location numbers by entering the desired front panel set-up number on the keyboard followed by pressing INSERT. The DELETE key will allow removal of a front panel set-up by pressing the DELETE key when the appropriate front panel set-up or location number is indicated on the display.

3-7 REVIEWING AN AUTOMATED SEQUENCE

The procedure for reviewing one of the previously stored auto-sequences, is to recall the auto-sequence and scroll through the memory locations in the auto-sequence. The auto-sequence can be reviewed on the displays or by printing the auto-sequence via a standard computer printer (see Section 3-9). For example, to review an auto-sequence you have stored in memory position 1:

A. Locate the AUTO SEQUENCE NUMBER LED in the PROGRAM Group. Press the button until the AUTO SEQUENCE NUMBER LED is lit.

B. Press the "1" and REPLACE buttons in the keyboard. The first two-digit group in the left display will be "01", indicating you are working with auto-sequence in memory position 1.

C. Locate the CHAIN LED in the PROGRAM Group. Press the button until the CHAIN LED is lit.

D. The displays will show three two-digit groups, such as **01 08 09**, indicating that front panel set-up number 9 will be the 8th test signal to be generated in auto-sequence 1. To review the sequencing of the front panel set-ups within the auto-sequence number one, use the "down" VERNIER to scroll to location one in the auto-sequence. Please note that there are 80 available locations in each auto-sequence.

As discussed in Section 3-4, the 3100A Generator has REPLACE, INSERT and DELETE editing functions available to facilitate revisions to auto-sequences.

3-8 RUNNING AN AUTOMATED SEQUENCE

The procedure for running an auto-sequence is to put the 3100A Generator into auto-sequence mode, recall the auto-sequence desired, and start the test. For example, to run auto-sequence number 1:

A. Locate the AUTO SEQUENCE NUMBER LED in the PROGRAM Group. Press the button until the AUTO SEQUENCE NUMBER LED is lit. Note that the displays will show three two-digit numbers. If the first two-digit group is the correct auto-sequence you wish to run, step B is not necessary. If the first two-digit group is the correct auto-sequence, and the second two-digit group is the correct location for starting the auto-sequence, steps B and C are not necessary.

B. Press the "1" and REPLACE buttons in the keyboard. The first two-digit group in the left display will be "01", indicating you have recalled auto-sequence number 1 from memory.

C. Review the second two-digit group in the left display. Whatever two-digit location is indicated will be the beginning location for signal generation in the auto-sequence. You can start an auto-sequence from any location within the sequence. If the location number in the display is not the desired beginning location of the auto-sequence, then the VERNIER buttons can be used to scroll the location number to the desired beginning location.

D. Press the START button in the OUTPUTS Group. The auto-sequence will stop when it encounters location number "00". That will normally be the 81st location number in each auto-sequence.

The user can limit the length of an auto-sequence by inserting a front panel set-up numbered "00" within the auto-sequence. This may be desirable if the user has an extensive test procedure in memory but may only wish to use a portion of the procedure at this point in time. For example, the user may have an auto-sequence of 70 front panel set-ups but currently only wants to run the front panel set-ups in locations 17 through 42. The auto-sequence should be edited by inserting a front panel set-up of "00" into location 43. The user can then scroll the auto-sequence so that the beginning of test signals are at location 17. The test signals will automatically end when the "00" front panel set-up is encountered at location 43. The front panel set-up "00" in location 43 can be removed later by usage of the DELETE function.

3-9 PRINTING MEMORY

The 3100A Generator has a parallel printer port located on the rear panel. You can attach a parallel printer, such as Epson , Okidata or Canon , to the 3100A Generator and print out the information contained in memory. The procedure for obtaining a print-out of memory is:

A. Locate the PRINT MEMORY LED in the PROGRAM Group. Press the button until the PRINT MEMORY LED is lit.

B. Press the START PRINT button in the top row of the keyboard.

The 3100A Generator will print two different reports listing the memory contents. The first report will provide a numerical listing of stored front panel set-ups (Figure 4). The second report provides a chart of the front panel set-ups contained in each auto-sequence listed in the location order within the auto-sequence (Figure 5). A chart is printed for each auto-sequence stored in memory.

A print-out of the front panel set-ups (as shown in Figure 6) contained within one specific auto-sequence can be obtained by the following procedure:

A. The CHAIN LED in the PROGRAM Group should be lit.

B. Use the VERNIER function to scroll the display to the location number where you wish the print-out to begin. You may start the print-out at any point within an auto-sequence.

C. Press the START PRINT button in the top row of the keyboard.

```
GENERATOR ID :  3100

              ST 3100A STORED PANEL SETUPS


PANEL No. 1

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz    3000 mS = DUR

A&B-CH ON     RS = 50 ohms      RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0 0



PANEL No. 2

FIXED PARAMETERS  SINE          0.00 dBm-600  10.000 kHz    2000 mS = DUR

A&B-CH ON     RS = 50 ohms      RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0 0



PANEL No. 3

FREQUENCY SWEEP    SINE          0.00 dBm-600  20.000 Hz TO 20.000 kHz
     5 Pts/Dec    20 = TIME MULT
A-CH ON       RS = 50 ohms      RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0 0



PANEL No. 4

LEVEL SWEEP  SINE         1.0000 kHz   -20.00 dBm-600 TO  10.00 dBm-600
  1.00 dB/Step    20 = TIME MULT
A-CH ON       RS = 50 ohms      RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0 0
```

Figure 4. Stored Front Panel Set-ups

ST 3100A STORED CHAIN TESTS

AUTO-SEQUENCE No. 1 Current Start Location : 1

1	3	4	2	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0

AUTO-SEQUENCE No. 2 Current Start Location : 1

1	4	3	2	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0

Figure 5. Stored Auto-Sequences

```
GENERATOR ID :  3100

              ST 3100A AUTO-SEQUENCE No. 1


    PANEL No. 1

FIXED PARAMETERS  SINE         0.00 dBm-600  1.0000 kHz    3000 mS = DUR

A&B-CH ON     RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0


    PANEL No. 3

FREQUENCY SWEEP    SINE          0.00 dBm-600  20.000 Hz TO 20.000 kHz
     5 Pts/Dec    20 = TIME MULT
A-CH ON       RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0


    PANEL No. 4

LEVEL SWEEP  SINE        1.0000 kHz   -20.00 dBm-600 TO  10.00 dBm-600
  1.00 dB/Step    20 = TIME MULT
A-CH ON       RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0


    PANEL No. 2

FIXED PARAMETERS  SINE         0.00 dBm-600  10.000 kHz    2000 mS = DUR

A&B-CH ON     RS = 50 ohms     RL = 600.00 ohms   DE-EMPH : Off
ANALYZER OP-CODE :  0 1 1 0 0 0 0 0 0
```

Figure 6. Current Auto-Sequence

SECTION 4

FREQUENCY SHIFT KEYING

4-1 GENERAL

The 3100A Generator has the ability to operate the 3200A Analyzer under remote control. This control is accomplished via a series of coded frequency bursts transmitted through the audio path being tested. This technique is referred to as frequency shift keying, or "FSK."

The 3100A Generator uses a ten-digit operation code linked to each front panel set-up stored in the 3100A Generator to control the 3200A Analyzer. The operation code allows the user to determine which type of measurement will be made, filter configuration, detection method, units of measurement, input configuration, and control over print functions of the 3200A Analyzer.

The codes used to control the 3200A Analyzer are listed in Figure 7. The first digit defines the type of signal (frequency sweep, level sweep, etc.) or utility to be performed (self check, print, reset, etc.). The second digit defines the measurement to be performed (level, ratio, IMD, phase, etc.). The third digit defines the high pass filter to be used (22 Hz, 200 Hz, 400 Hz, or none). The fourth digit defines the low pass filter to be used (15 kHz, 22 kHz, 30 kHz, 80 kHz, or none). The fifth digit defines noise weighting response curves (A, CCIR, external, or none). The sixth digit defines detector (AVG, RMS, PPG, or Quasi Peak). The seventh digit defines unit of measure for level measurement (Volts, 600 dBm, Watts, or 150 dBm). The eighth digit defines unit of measure for distortion measurement (% or dB). The ninth digit defines input configuration (A Channel, B Channel, or A and B Channels). The tenth digit defines input termination (Bridging, 600 ohms or 150 ohms).

Referring to Figure 7, the operation code "**1 0 0 0 0 1 2 0 1 1**" would program the 3200A Analyzer to measure level, using Average Response detector in dBm 600 ohms, on Channel A, with Bridging Input.

Digit	Number Chosen	Definition
1	1	Normal/New Test
2	0	Level - flat
3	0	blank
4	0	blank
5	0	blank
6	1	AVG Response
7	2	dBm 600 ohms
8	0	blank
9	1	Channel A
10	1	Bridging Input

For example, assume you want to measure Total Harmonic Distortion in a frequency sweep, measured using a Quasi Peak detection. The two channel measurement is in dB with 600 ohm input and a 22 Hz high pass and 22 kHz low pass filter. The operation code would be as follows:

Digit	Number Chosen	Definition
1	3	Frequency Sweep
2	5	THD vs Freq
3	1	22Hz hi pass filter
4	2	22kHz lo pass filter
5	0	blank
6	4	Quasi-Peak Detector
7	0	blank
8	2	dB unit of measure
9	3	A & B Channels
10	2	600 ohm Input

or "**3 5 1 2 0 4 0 2 3 2.**"

The operation code is used during the storage of front panel set-ups in the 3100A Generator. To input an operation code, the 3100A Generator must have the FSK LED (located in the PROGRAM Group) lit. Detailed examples of how to input a front panel set-up into memory are provided in Section 3-2. In the example in Section 3-2, we input an FSK operation code of "0000010000" since that example assumed FSK was not being utilized. The procedure for utilizing FSK operation codes is similar to Section 3-2 except the desired ten-digit code is substituted for the "0000010000". For example, in Section 3-2, Step D, instead of entering the "0000010000" the user would enter "**3 5 1 2 0 4 0 2 3 2.**" The ten-digit operation code will be indicated on the two displays.

A more detailed description of the capabilites of the 3200A Analyzer is contained in the 3200A Analyzer Operator's Manual.

OPERATION CODE GUIDE

#	1st Character	2nd Character	3rd	4th	5th	6th	7th	8th	9th	10th	#
0	No Op. Code	Level - Flat	-*	-*	-*	-*	-*	-*	-*	-*	0
1	Normal/New Test	Level - Filtered	22Hz	15kHz	'A'	AVG	VOLTS	%	A Chan	Bridging	1
2	Noise	Ratio	200Hz	22kHz	CCIR	RMS	600dBm	dB	B Chan	600 ohm	2
3	F-Sweep	Notch Lock	400Hz	30kHz	EXT	PPG	150dBm		A&B	150 ohm	3
4	L-Sweep	THD vs. Level	No Filt	80kHz	No wgt	Q-PK	WATTS				4
5	STOP	THD vs. Freq		No Filt							5
6	PRINT	IMD									6
7	Reset Memory	Phase (Deg)									7
8	Self Check	Phase (Time)									8
9	Set Level	Chnl Sep									9

Notes:

a) * (-) means no change from last test (therefore code will not be transmitted).

b) 10 character operation code = 100 milliseconds transmission time (as few as 2 characters may need to be transmitted).

Figure 7. Operation Code Guide

SECTION 5

FRONT PANEL CONTROLS

5-1 GENERAL

The 3100A Generator has 18 control buttons with 42 LEDs possible and 20 keyboard buttons. The buttons and LEDs are divided into seven functional groups. This Section provides a brief description of each button and LED.

5-2 PROGRAM GROUP

A. SET-UP RECALL. Used to recall front panel set-ups from memory.

B. SET-UP STORE. Used to store front panel set-ups into memory. Up to 80 front panel set-ups (numbers 1 through 80) can be stored in non-volatile memory.

C. FSK CODE. Used to enter frequency shift keying code number for remote control of 3200A Analyzer. Each front panel set-up must have a non-zero FSK operation code before it may be entered into front panel memory. FSK code may also be used to delete a front panel set-up from memory by inputting an operation code of "0000000000".

D. AUTOSEQUENCE. Used to recall existing auto-sequences or create new auto-sequences. Up to 16 auto-sequences can be stored in memory (numbers 1 through 16).

E. CHAIN. Used to link together front panel set-ups to form auto-sequences. Also used in conjunction with keyboard for editing of auto-sequences. Up to 80 front panel set-ups can be linked in each auto-sequence. A front panel set-up can be used numerous times in one auto-sequence. A front panel set-up can also be used in numerous auto-sequences.

F. PRINT MEMORY. Used to print-out contents of front panel memory through standard parallel port. Two different reports are printed, providing a comprehensive numerical listing of auto-sequences and front panel set-ups.

G. GEN ID. Used to input a user-selected identification number for the 3100A Generator. This identification number will appear in all print-outs and can be utilized when several different 3100A Generators are communicating with one or more companion 3200A Analyzers. The assigned Generator identification number will also appear on all print-outs from the 3200A Analyzer. The user may choose to use this as a date field or input any other desired numeric code of up to five digits.

5-3 WAVEFORM GROUP

A. SINE. Used in conjunction with the FIXED PARAMETER TEST MODE to output a sinewave of 1 Hz to 102.39 kHz. (1 Hz to 9.9 Hz only operational after initial usage of oscillator). Automatically selected when in FREQUENCY SWEEP TEST MODE. The 3100A Generator can output a sinewave of 10 Hz to 102.39 kHz while in the FREQUENCY SWEEP TEST MODE.

B. SQUARE. Used in conjunction with the FIXED PARAMETER TEST MODE to output a squarewave of 1 Hz to 50 kHz. (1 Hz to 9.9 Hz only operational after initial usage of oscillator). Squarewaves can be used in front panel set-ups but front panel set-up cannot be used in auto-sequence.

C. IM. Used in conjunction with the FIXED PARAMETER TEST MODE or LEVEL SWEEP TEST MODE to output SMPTE Intermodulation Distortion test signal. (IM is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 004, your unit has the ability to generate the IM signal).

D. LF OFF. Used in conjunction with the FIXED PARAMETER TEST MODE or LEVEL SWEEP TEST MODE to output SMPTE Intermodulation Distortion test signal without Low Frequency.

E. BURST. Used in conjunction with FIXED PARAMETER TEST MODE to output 100 Hz to 102.39 kHz toneburst. Frequency defined by usage of FREQUENCY button in PARAMETERS GROUP. Other characteristics (on time, off time, attenuation) defined by usage of functions in PARAMETERS GROUP. Toneburst signals can be stored in front panel set-ups but cannot be used within an auto-sequence. (Burst is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 005, your unit has the ability to generate Burst).

F. SINE/STEP. Used in conjunction with FIXED PARAMETER TEST MODE to output a 100 Hz to 102.39 kHz sinewave followed by a D.C. step signal equal to the peak amplitude of the sinewave. Frequency defined by usage of FREQUENCY button in PARAMETERS GROUP. Other characteristics (sine time on, step time on) defined by usage of functions in PARAMETERS GROUP. Sine/step signals can be stored in front panel set-ups but cannot be used within an auto-sequence. (Sine/Step is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 005, your unit has the ability to generate Sine/Step).

5-4 TEST MODE

A. FIXED PARAMETER. Used in conjunction with FREQUENCY or LEVEL in PARAMETERS GROUP and with selection from WAVEFORM GROUP.

B. FREQUENCY SWEEP. Used in conjunction with SWEEP button in PARAMETERS GROUP to define sweep characteristics. Automatically selects SINE in WAVEFORM GROUP.

C. LEVEL SWEEP. Used in conjunction with SWEEP button in PARAMETERS GROUP to define sweep characteristics. SINE and IM in WAVEFORM GROUP can be accessed.

D. AUTO-SEQUENCE. Indicates 3100A Generator is in Auto-Sequence mode. This LED is activated by usage of AUTO SEQUENCE button in PROGRAM GROUP. LED is deactivated by selection of other TEST MODE.

5-5 PARAMETERS GROUP

A. FREQUENCY. Used in conjunction with keyboard to define frequency of SINE, SQUARE, BURST, SINE/STEP and LEVEL SWEEPS.

B. LEVEL. Used in conjunction with keyboard to define signal level of SINE, SQUARE, IM, BURST, SINE/STEP and FREQUENCY SWEEP. Maximum range of 24.5 milliVolts to 28.6 V, depending upon load, source impedance and output configuration. In auto-sequences 9 through 18, the first level setting encountered in the auto-sequence, will be used throughout that auto-sequence. Units of measure include millivolts, Volts, dBm 150 and dBm 600.

C. DURATION. Used when storing FIXED PARAMETER signals into front panel memory. Signals can be stored with 5 millisecond to 10 second durations.

D. LOAD OHMS. Used in conjunction with keyboard to define load impedance of

50 ohms to 99,999 kOhms. Please note that whatever load impedance is input in the first front panel set-up encountered while running an auto-sequence, will be used throughout the remainder of that entire auto-sequence.

E. SWEEP START LIMIT. Used in conjunction with keyboard and FREQUENCY SWEEP or LEVEL SWEEP to define beginning point of sweep. Frequencies of 10 Hz to 102.39 kHz are available, level of -90 dBm 600 to 30.65 dBm 600 are available. Please note that sweeps can sweep upward or downward.

F. SWEEP STOP LIMIT. Used in conjunction with keyboard and FREQUENCY SWEEP or LEVEL SWEEP. Frequencies of 10 Hz to 102.39 kHz are available, level of -90 dBm 600 to 30.65 dBm 600 are available. Please note that sweeps can sweep upward or downward.

G. SWEEP PTS/DECADE or SWEEP dB/STEP. Used in conjunction with keyboard and FREQUENCY SWEEP or LEVEL SWEEP. Points per decade internally calculated to provide linear increments on a log frequency scale. 4 to 255 points per decade available. dB/STEP available from .05dB to 20.00dB in .05dB steps.

H. SWEEP TIME MULTIPLIER. Used in conjunction with keyboard, FREQUENCY SWEEP and LEVEL SWEEP. Sweep can be slowed from most rapid speed (TIME MULTIPLIER = 1) to take 999 times longer (TIME MULTIPLIER = 999). TIME MULTIPLIER can be set at any whole number between 1 and 999.

I. BURST TIME. Used in conjunction with keyboard, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define length of time in milliseconds that toneburst will be generated without attenuation. Duration of 10 milliseconds to 10 seconds available. Also used in conjunction with keyboard, FIXED PARAMETER TEST MODE and SINE/STEP WAVEFORM to define length of time in milliseconds that sinewave will be generated. Duration of 10 milliseconds to 10 seconds available.

J. ATTENUATED or STEP TIME. ATTENUATED TIME is used in conjunction with keyboard, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define length of time in milliseconds that toneburst will be attenuated. Duration of 10 milliseconds to 10 seconds available. STEP TIME is used in conjunction with keyboard, FIXED PARAMETER TEST MODE and SINE/STEP WAVEFORM to define duration in milliseconds of D.C. step signal. Duration of 10 milliseconds to 10 seconds available.

K. BURST ATTEN. Used in conjunction with keyboard, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define amount of attenuation in dB that toneburst will be reduced while attenuated. Available range of 5dB to 60dB in 5dB increments.

5-6 OUTPUTS

A. CHANNEL A, B. Defines whether only Channel A, only Channel B, or both Channels (both LEDs lit) will be output. If neither LED is lit, then both Channels are terminated.

B. SOURCE OHMS 50, 150, 600. Defines source ohms.

C. DE-EMPH 75, 50, 25, 10 microseconds. Used in conjunction with all waveforms and test modes. Defines de-emphasis curve used. If no LEDs are lit, then no de-emphasis curve will be used. (De-emphasis is purchased as an option on the 3100A Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 006, your unit has De-emphasis capability).

D. REPEAT. Used in conjunction with FREQUENCY SWEEP and LEVEL SWEEP TEST MODE. Allows user to output continually repeating sweeps until STOP button or REPEAT button is pressed. This function is not available for usage within auto-sequences. REPEAT function is not used with FIXED PARAMETERS, as fixed signal is constantly output until STOP button in pressed. **IMPORTANT** Do not allow the 3100A Generator to continuously output level sweeps for a long period of time. It is possible to leave the 3100A Generator in a REPEAT sweep condition and wear out the output attenuator relays. Although the relays have an estimated life in excess of one million operations, it is possible to perform more than 100 sweeps per minute if the 3100A Gnerator is allowed to remain in a REPEAT sweep condition.

E. START. Used to initiate all test signals. Fixed signals or repeating sweeps will be constantly output until STOP button is pressed.

F. STOP. Used to cease generation of signals.

G. REMOTE. Indicator LED lit when 3100A Generator is being controlled by external controller via G.P.I.B. or RS-232 bus. LED is not user-accessible through a button.

5-7 CALIBRATE/RESET

A. CALIBRATE. Used to recalibrate frequency range of 3100A Generator compared against internal standards. The 3100A Generator will automatically recalibrate the full frequency range of instrument upon turning the power switch on. By pressing the CALIBRATE button when the STOP LED is lit, the 3100A Generator will recalibrate the full frequency range of instrument. If the CALIBRATE button is pressed, the AUTO SEQUENCE LED in the PROGRAM GROUP is lit, and the STOP LED is lit, all fixed parameter frequencies stored in all front panel set-ups will be calibrated. If the CALIBRATE button is pressed when a FIXED PARAMETER signal is being generated, the specific frequency being generated will be calibrated. Frequency accuracy after calibration is .03% for Fixed Parameter and .1% for Sweeps.

B. RESET. After power is switched on, the 3100A Generator will always return to the state it was in at the point where power was turned off. By pressing RESET, the 3100A Generator will return all location numbers within auto-sequences to location one and return the front panel to a factory determined set-up. No changes are made to stored front panel set-ups or auto-sequences. RESET may also be used to recover from abrupt power failures or other possible problems.

5-8 KEYBOARD

A. TOP ROW OF BUTTONS. Each of the four top buttons serve two functions. If the TEST MODE indicates AUTO SEQUENCE, then the 3100A Generator is being used to program the front panel memory. When programming the front panel memory, the left three buttons in the top row are used for editing memory (REPLACE, INSERT and DELETE) when the CHAIN LED is lit in the PROGRAM GROUP. The right button in the top row is used in conjunction with the PRINT MEMORY LED in the PROGRAM GROUP to initiate printing.

If the 3100A Generator is in a TEST MODE other than AUTO SEQUENCE, the top row of buttons are used following keyboard entries to designate units of measure and automatically enter the data. The right button (UNITS DISPLAYED) is used

to enter data in Hertz, Volts, Ohms, Points per Decade, Time Multiplier Units, or milliseconds. Unless an alternative button in the top row is desired, the UNITS DISPLAYED button should be used following each keyboard entry. The second button from the right allows the user to select units of measure of milliVOLTS and milliSECONDS and also automatically inputs the keypad entry (no enter command is needed). The third button from the right allows the user to select units of measure of kHertz, kOhms or dBm 600, and also automatically inputs the keypad entry (no enter command is needed). The left button allows the user to select dBm 150 as a unit of measure and also automatically inputs the keypad entry (no enter command is needed).

B. VERNIER/10dB STEPS. When this LED is lit, 10dB STEPS vernier function is operable. User can increase or decrease pre-selected level by 10 dB steps by pressing "up" or "down" VERNIER buttons in keyboard. 3100A Generator will automatically adjust level without regard to level unit of measure selected. When LED is not lit, vernier can be used to increase or decrease pre-selected level or frequency by pressing "up" or "down" VERNIER buttons in keyboard.

C. CLR. Clear is used to remove incorrect data input via keyboard.

D. CHS. Used to change sign of data input via the keyboard prior to data being entered into memory. As all keyboard entries are assumed to be positive, it is necessary to use CHS to input a negative number, such as -10 dBm 600.

E. Numeric Keys. Used to input various user-selected parameters. If the user input parameter is not within the acceptable range of the 3100A Generator, the 3100A Generator will default to the closest acceptable value and will indicate this value on the display. For example, if 110 kHz is entered, the 3100A Generator will default to 102.39 kHz and indicate this on the display.

Data input is not stored into memory until one of the four enter buttons (top row of keyboard) is used.

SECTION 6

G.P.I.B. (GENERAL PURPOSE INTERFACE BUS)

AND RS-232 BUS

6-1 GENERAL INFORMATION

The 3100A Generator may be operated under remote control by a suitable computer which utilizes either the G.P.I.B. or RS-232 bus. The G.P.I.B. is purchased as an option on the 3100A Generator. The RS-232 bus is standard equipment on all 3100A Generators. Except for POWER and PRINT, all front panel controls are fully programmable via G.P.I.B. or RS-232. Typical data rate when talking is 550 Bytes/s and when listening is 1 KB/s.

6-2 G.P.I.B.

A. What is the GPIB?

Some years ago, it was decided that there was a need for a general purpose interface bus that would allow different kinds of devices to communicate with each other. Even though these devices may be quite different from each other in what function they perform, they can still communicate with each other. Some devices may only be able to send data, like a tape reader. This type of device is known as a "Talker". Some devices may only be able to receive data, like a signal generator. This type of device is known as a "Listener". Some devices may be able to both talk and listen, like a digital voltmeter. Of course, some device may have to oversee these talkers and listeners while they are communicating. This type of device is called a "Controller".

The bus itself has many names. The three official names are:

1. IEEE 488-1978
2. ANSI MC1.1
3. IEC 625-1

These are all the same, except that the IEC bus uses a different connector. Adaptors for the IEC cable are readily available. Except for the IEC cable, the 3100A will work with any of the above names. Some common bus names used are:

1. IEEE-488
2. GPIB
3. HP-IB

In order for different instrument designers to be able to make their devices work on the bus, certain rules had to be made by the people who wrote the standard for the bus. The main part of these rules is called the Interface Functions. These define the rules of bus communications. If the reader desires a complete understanding of the bus, he should consult the document: "IEEE Standard Digital Interface for Programmable Instrumentation", available from the IEEE at 345 East 47th Street, New York, NY 10017.

B. What can the 3100A do on the GPIB?

The 3100A can both talk and listen and can also respond to most controller commands. It cannot act as a controller. Before going any further, it is necessary to discuss addresses. In order to know "who's who" on the bus, each device must have its own address. This can be any number between 0 and 30, inclusive. Addresses are used much like they are in the mail. If you want to send a letter to someone, you need to know their address. Address switches are usually found on the rear panel of a device, as on the 3100A. The procedure for setting the 3100A address is found later on in this section.

C. System Set-up

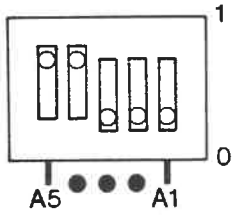
Up to 15 instruments can be connected on the bus, including the controller. However, the total length of all the cables used must be less than or equal to 2 meters times the number of devices connected to the bus, up to a maximum of 20 meters. Caution should be taken if individual cable length exceeds 4 meters. Not all devices must have their power on, but generally at least two-thirds of them should. Either of the two methods shown in Figure 8 can be used to connect up a system.

6-3 ADDRESSING

The GPIB address switch is located on the rear panel. If the address is to be changed, it should be done so with the power switch off; otherwise, the microprocessor will not read the new address. The address is set with the first five switches, A1- A5. The last three switches have no function. The address is selectable from 1 to 30 and is factory set at 24. The switch is coded in binary (base two). Therefore, the factory setting of 24 appears as follows:

The address is:

A1	0 X 2	=	0
A2	0 X 2	=	0
A3	0 X 2	=	0
A4	1 X 2	=	8
A5	1 X 2	=	16
	TOTAL:		24



GPIB ADDRESS SWITCH

6-4 REMOTE/LOCAL MODES

In remote, all of the 3100A front panel controls are disabled except those which are not controllable remotely and the RESET button. However, all LED displays and output levels are valid. In remote, the 3100A may be addressed to talk or listen. The "REMOTE" LED located by the START/STOP button will light when the 3100A is in remote.

In local, the 3100A front panel is fully operational and the instrument will respond to the Remote message.

6-5 PROGRAMMING VIA G.P.I.B. OR RS-232

Programming syntax for the 3100A is derived from IEEE Std 782-1982, Recommended Practice for Code and Format Convention. The major difference between this syntax and that of the standard, lies in the sequence required to specify measurement units. The standard recommends use of a header field to describe units of measurement as well as function. The syntax for the 3100A uses a header only to define function or type of data and uses a suffix to define units of measurement. The structure of a command thus follows a customary sequence.

Function Numeric Data Units

In addition, this syntax requires a separator between data and the suffix which follows the data.

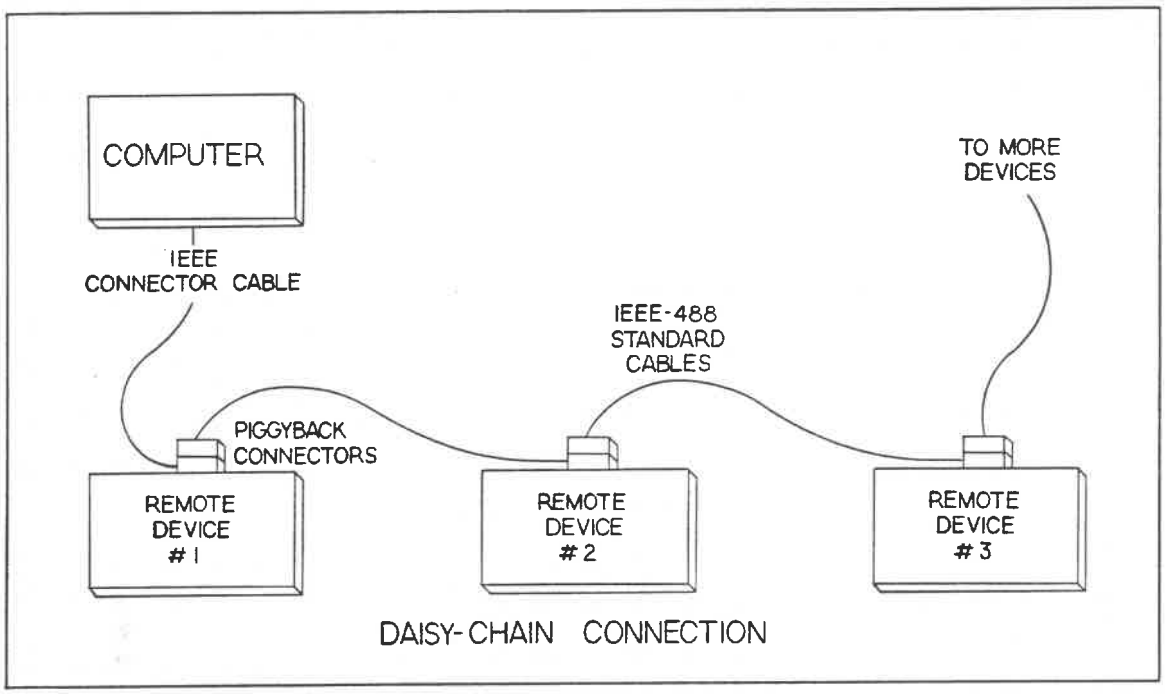
The general form for a program message (command) is:

Header Separator Data Separator
Units Separator

A Header defines a function or the type of data which follows. A data message is the numeric string in "floating point" or exponential representation, i.e., 123.45 or 1.2345e2. For example, to program a start frequency, one might send the following "command" to the generator:

SFQ,4.23 kHz crlf or
sfq 4.23 KHZ crlf or
SFQ 4.23E+03 Hz lf

The syntax allows interchangeable use of space and comma as separators and does not distinguish between upper and lower case alpha characters.



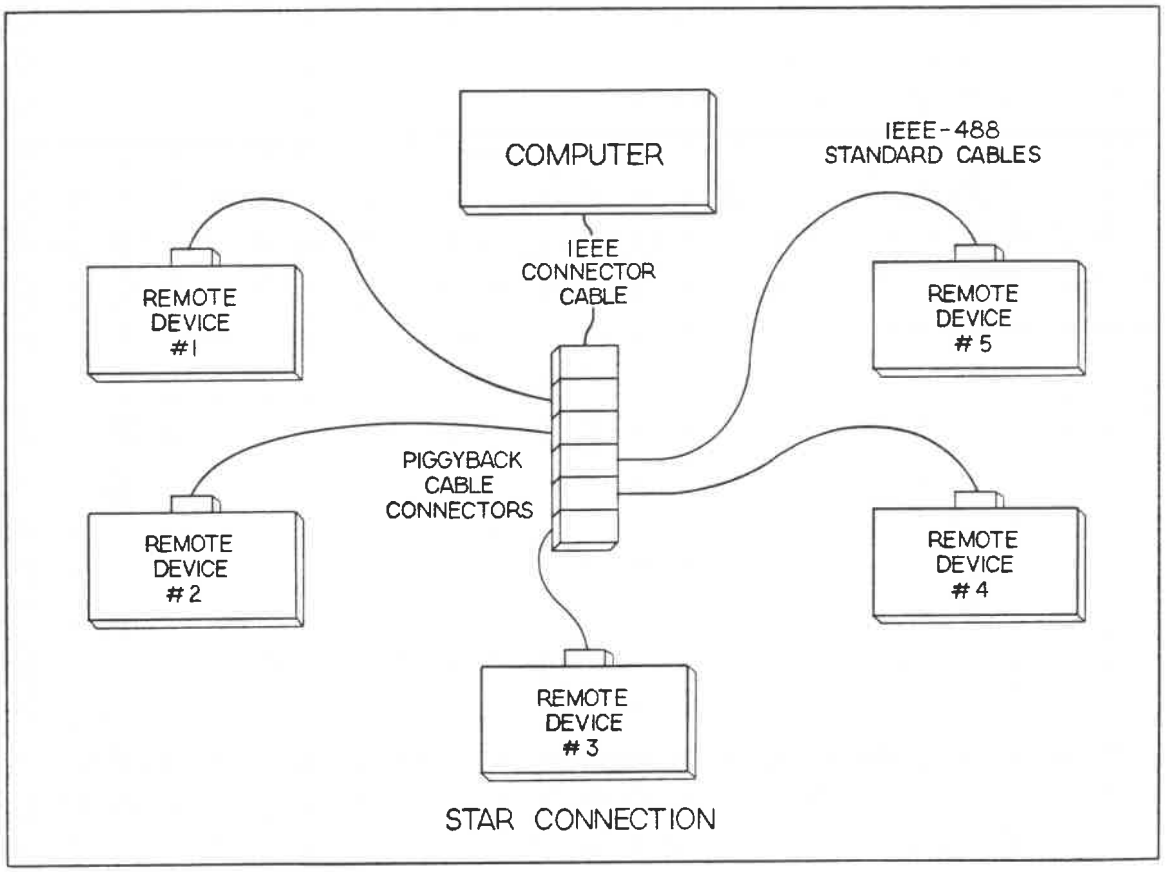


Figure 8. GPIB System Set-up

After a function or data-type command has been sent to the 3100A, it is not necessary to repeat the command until the function or data need to be changed. Command strings are limited to a maximum of 64 characters between cr or crlf terminators, which should not require any special care in programming. Extraneous delimiter characters that may be sent by some GPIB controllers will be removed automatically from the character stream and will not be counted in determining the maximum command string length.

In parsing a command input string, the 3100A processes each element of the string as it is encountered, just as it responds to equivalent operator entries into the front panel. When the 3100A cannot interpret a character sequence, it will ignore all characters after the offending sequence until an end of line terminator is encountered. In this event, status messages will identify the error and the offending character sequence.

Please note that the Start command (STR) is special in that any command which follows STR in a single line (until the next line terminator) will be completely ignored.

6-6 PROGRAMMING LANGUAGE FOR THE 3100A AUDIO GENERATOR

TEST MODE:

FRS	FrequencySweep
FXP	FixedParameters
LVS	LevelSweep
SEQ	AutoSequence

SWEEP PARAMETERS: Header must be followed by data.

DBS	dBperStep	also sets Level Sweep
EFQ	EndFrequency	also sets Frequency Sweep
ELV	EndLevel	also sets Level Sweep
PPD	PointsperDecade	also sets Frequency Sweep
SFQ	StartFrequency	also sets Frequency Sweep
SLV	StartLevel	also sets Level Sweep
FTM	FrequencySweepTimeMultiplier	also sets Frequency Sweep
LTM	LevelSweepTimeMultipler	also sets Level Sweep

FIXED PARAMETERS: Header must be followed by data except as shown.

BRA	BurstAttenuation	sets Burst and Fixed Parameters
DUR	Duration	sets Fixed Parameters
FRQ	Frequency	ignored if not in Fixed Parameters or Level sweep, status 101
LDR	LoadResistance	sets Fixed Parameters if in Auto Sequence Mode
LVL	Level	ignored if not in Fixed Parameters or Frequency Sweep, status 102
TON	TimeOn	TON and TAT sets Burst if not in
TAT	TimeAttenuated	Sine-Step or Burst

OUTPUTS:

A&B	AandBchannels	sets Fixed Parameters if in Auto Sequence Mode
ABT	AandBchannelsTerminated	floating, terminated in selected source resistance, sets Fixed Parameters if in Auto Sequence Mode
ACH	Achannel	B channel terminated, sets Fixed Parameters if in Auto Sequence Mode
BCH	Bchannel	A channel terminated, sets Fixed Parameters if in Auto Sequence Mode
CAL	Calibrate	
DE1	De-emphasis 10 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE2	De-emphasis 25 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE5	De-emphasis 50 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE7	De-emphasis 75 microsec	sets Fixed Parameters if in Auto Sequence Mode
DEO	De-emphasisOff	sets Fixed Parameters if in Auto Sequence Mode
NVR	NormalVernier	0.05 dB steps after setting LVL
RPT	RepeatSweep/AutoSeq	
SNG	SingleSweep/AutoSeq	
SR5	SourceResistance50ohms	sets Fixed Parameters if in Auto Sequence Mode
SR1	SourceResistance150ohms	sets Fixed Parameters if in Auto Sequence Mode
SR6	SourceResistance600ohms	sets Fixed Parameters if in Auto Sequence Mode
STP	StopOutput	
STR	StartOutput	(and start sweep or sequence)
TDB	VernierTendBSteps	10 dB steps after setting LVL
VDN	VernierDown	.01% freq steps after setting FRQ, increments chain location in Auto Sequence.
VUP	VernierUp	

WAVEFORM: Header is not followed by data

BRS	Burst	sets Fixed Parameters if in Auto Sequence Mode
IMD	IMDistortion	ignored if not in Fixed Parameters or Level Sweep (status 64)
ILO	IMLowfrequencyOff	sets Fixed Parameters if in Auto Sequence Mode
SIN	Sine	sets Fixed Parameters if in Auto Sequence Mode
SNS	SineStep	sets Fixed Parameters if in Auto Sequence Mode
SQR	Square	sets Fixed Parameters if in Auto Sequence Mode

PROGRAM: Header must be followed by data

RCL	ReCaL1	recall the panel number which follows
STO	STOre	store a panel setup into a panel number
FSK		sets Fixed Parameters if in Auto Sequence Mode Enter FSK code for controlling 3200A Analyzer in Auto Sequence Mode. First entry is left-hand display, second is right-hand display. Will not accept leading zeros.
SEQ	AutoSequenceNumber	select an auto sequence number for execution or for storage of chained panel setups
CHN		entering (ENT) panel number automatically advances chain location number
IDN	GeneratorIDNumber	sets Auto Sequence Mode

The above PROGRAM commands are intended to facilitate loading and reading of panel-operated programs by an external controller. They may be used to program actions of the 3100A and 3200A, but if they are so used, the programmer should realize that his documentation of the program may become disconnected from reality.

UNITS:

DB6	dBm600ohm	All units entry words must be preceded by valid data. If not, a serial poll will be executed.
DB1	dBm150ohm	
HZ	Hertz	
KHZ	kiloHertz	
OHM	Ohm	
KOM	kiloOhm	
MSC	millisec	
MVT	milliVolts	
VLT	Volts	
ENT	Enters displayed units	In Auto Sequence Mode, data (chain no. 0-16) followed by ENT sets the current chain location number to 1. In Chain Mode, ENT increments location number.

DATA REQUESTS:

ERR?	Error	returns the string which caused last error
IDN?	GeneratorIDNumber	returns the ID digit string, not the value
STS?	Status	returns the status byte for the latest error

STATUS CODES:

Whenever the 3100A cannot interpret a command, a service request will be executed and a status byte will be available to the controller via a serial poll. The meanings of the status bytes is as follows:

Hex	Decimal	
61	97	Data was expected, an E for exponential notation was found, but the characters following the E did not denote a valid exponent value.
62	98	Data was expected and an E was found, but non-numeric characters precede the E.
63	99	A units code was received but not preceded by a numeric string. Note that any string containing an E will be analyzed as though it is numeric whenever numeric data is expected, so a string with an E will fail with status bytes 61 or 62, not 63.
64	100	The data was syntactically correct but not in the available range for the value being programmed. The 3100A has set the programmed parameter to the closest limit value.
65	101	The code FRQ was interpreted, but the 3100A had not been programmed for Fixed Parameters or Level Sweep
66	102	The code LVL was interpreted, but the 3100A had not been programmed for Fixed Parameters or Frequency Sweep.
6A	106	Command doesn't match anything in list of commands

When there is no doubt about which state the 3100A must be in, a command does not have to be preceded by all the commands which would have to be executed from the front panel in order to arrive at the same state. For example, it is not possible to enter the start level for a Level Sweep from the front panel unless the 3100A is already in the Level Sweep state. The code for start level, SLV, received over the GPIB, will set the 3100A into the Level Sweep state and need not be preceded by the command LVS. For the few cases which are ambiguous, the 3100A will ignore commands which are received while it is not in the proper state and generate a service request to show the error.

SECTION 7

MOST COMMON USAGE PROBLEMS

7-1 GENERAL

The 3100A Generator is an extremely flexible and powerful device with extensive programming capabilities. As with any complex device, there are some common input errors that may occur. To assist you in diagnosing or preventing possible errors, the following list of difficulties and suggested remedies is provided. **IMPORTANT** The 3100A Generator can generate high level output of up to 30 dBm into 600 ohms with both channels driven. Check that your load resistance or device under test will not be damaged before accessing any output level in excess of 10 dBm 600.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Keyboard unresponsive, all LEDs lit	Transient Power Lock	Turn power off. Allow at least 5 seconds between turning off and on. If this does not correct situation, press RESET button. If keyboard remains unresponsive, contact factory.
Keyboard unresponsive, proper LEDs are lit	Stuck switch	Check that all switches are "free and clear." Check for button stuck in depressed condition.
Keyboard and front panel unresponsive	Printer not connected on line	User has pressed PRINT MEMORY button in keyboard and printer is not connected or is not ready to print. To recover, turn power switch off, wait 10 seconds and turn power back on.
Cannot access function	Unit does not include option	Intermodulation signal, Toneburst, Sine/Step and De-emphasis are optional equipment. Options can be retrofitted in field. Call factory for more information.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
CALIBRATE LED remains lit for several minutes	Software Lock	Turn power off. Allow at least 5 seconds between turning off and on. If this does not correct situtation, press RESET button. If CALIBRATE LED remains locked, contact factory.
CALIBRATE LED flashes for a few seconds after each FIXED PARAMETER frequency is keyed in	Frequency calibration software problem	Turn power off. Allow at least 5 seconds between turning off and one. If this does not correct situation, press RESET button. If keyboard remains unresponsive, contact factory.
No signal being output	Output configuration incorrect	Check CHANNELS LED for channel(s) being output versus channel(s) connected to device under test. If CHANNELS LED is not lit, then both channels are terminated. Also check that START green LED is lit.
No signal being output	Both channels being monitored on two channel oscilloscope with phase reversal	Invert connector on one channel to oscilloscope. Phase reversal into grounded device (oscilloscope) shorted outputs. See Section 2-1.
Unexpected signals being output	FSK code output	Brief tonebursts will be transmitted if FSK operation codes are being used. If using analyzer other than 3200A Analyzer, FSK operation codes should be suppressed. See Section 3-6.

7-2 FIXED PARAMETER TEST MODE

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access frequency LED during IMD test	IM uses pre-determined frequencies	Intermodulation signal waveform has pre-determined frequencies (as per SMPTE).
Sine/step or burst waveform not working properly	Incorrect parameters selected	Frequency of sine must equal or exceed 100 Hz, sine burst time and step on time must equal or exceed 10 milliseconds.
Duration function not limiting signal time	Only functional in auto-sequence test mode	Signal duration is only applicable when signal is stored in front panel memory for later use in auto-sequence. Fixed parameter signal is continuously output if user is not running signal from front panel memory during auto-sequence.

7-3 FREQUENCY SWEEP TEST MODE

Cannot access Square-wave, IMD, Burst or Sine/Step	Incorrect waveform selected	Sine is the only waveform allowed during frequency sweep.
Sweep not outputting 1 Hz to 9.99 Hz	Incorrect parameter selected	Sweep range during sweep is from 10 Hz to 102.39 kHz
Cannot access duration LED	function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep.
Frequency indicated in right display does not correspond to start or stop frequency limits	-	If not accessing start or stop frequency limits, right display will indicate last Fixed Parameter frequency used by the 3100A Generator. Check START LIMIT and STOP LIMIT SWEEP buttons.

7-4 LEVEL SWEEP TEST MODE

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access Squarewave, Burst or Sine/Step	Incorrect waveform selected	Sine and IM are the only waveforms allowed during level sweep.
Cannot access duration LED	Function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep.
Cannot select starting and stopping limits using mV or V	Unit of measure incorrect	Start and stop limits only available in dBm 150 and dBm 600.
Level indicated in left display does not correspond to start or stop level limits	-	If not accessing start or stop level limits, left display will indicate last Fixed Parameter level used by the 3100A Generator.

7-5 FRONT PANEL SET-UPS

Front panel set-up cannot be recalled (left display indicates "_ _ _")	No front panel set-up stored in that memory location	Follow procedure in Section 3-2 to store front panel set-up. Also, check FSK code to make sure it contains at least one non-zero digit.
Changes made to front panel set-up are not changing signal after recall	Changes not stored into memory	Follow procedure in Section 3-4. It is necessary to use STORE Function before changes are recorded in memory.

7-6 AUTO-SEQUENCES

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access auto-sequence test mode	Incorrect test mode selected	Press AUTO-SEQUENCE button in PROGRAM Group.
Auto-sequence cannot be recalled	Incorrect parameter selected	Auto-sequences cannot be assigned number greater than 16. Auto-sequence LED in PROGRAM Section must be lit.
EDIT buttons not functioning	Improper function selected	CHAIN LED in PROGRAM Group must be lit for edit functions to work.
Front panel set-up will not store within auto-sequence	Memory not being accessed	Follow procedure in Section 3-6. Check that REPLACE button is being pressed after keyboard entry of front panel set-up number. Also make sure CHAIN LED is lit when accessing REPLACE button.
Unexpected signals being output	FSK code output	Brief toneburst will be transmitted throughout auto-sequence if FSK operation codes are being used. If using analyzer other than 3200A Analyzer, FSK operation codes should be suppressed. See Section 3-6.
Front panel set-up within auto-sequence is being ignored. No signal generated	Front panel set-up has unacceptable parameters.	Front panel set-ups using Burst and Sine/Step waveforms will be ignored within an auto-sequence. Also, a front panel set-up may contain all zeros in operation code, which means it will be ignored or hidden in auto-sequences.
Level being output is different than expected	Level over-ride feature	In auto-sequence numbers 9 through 16, the first Fixed Parameter level setting encountered will be used throughout the entire remaining auto-sequence. **NOTE** If the auto-sequence is started other than at location one, the level will be set based upon the first Fixed Parameter level encountered. See Section 3-6.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Auto-sequence does not start, or starts other than where expected	-	The auto-sequence will start at the location number specified in display and continue until it encounters a location number with an associated front panel set-up number "00". Scroll the auto-sequence to an appropriate beginning location before starting the sequence.
Load impedance is different than expected	Load impedance override feature	The first load impedance setting encountered within an auto-sequence will be used throughout the entire remaining auto-sequence. **NOTE** If the sequence is started other than at location one, the load impedance will be set based upon the load impedance in the first front panel set-up encountered. See Section 3-6.
3200A Analyzer is not performing measurements while using 3100A Generator in auto-sequence mode	no FSK code being transmitted	If the operation code in the first front panel set-up encountered while running an auto-sequence contains a leading zero, then FSK code transmission will be suppressed throughout the entire remaining auto-sequence. If the auto-sequence is started at other than location one, check to make sure that the front panel set-up contains a valid operation code. See Section 3-6.

SECTION 8

MAINTENANCE

8-1 GENERAL

CAUTION: Do not attempt to repair any fault inside the 3100A Generator. Specialized test equipment and procedures are required to obtain the specified performance. Also, certain components in the 3100A Generator are subject to damage by electrostatic voltages which can occur during handling or probing.

IMPORTANT: Do not operate the 3100A Generator from a 2-wire, ungrounded power system or through a 3-prong to 2-prong adapter.

IMPORTANT: The push button switches are permanently lubricated. Application of any lubricant or contact cleaner will shorten their operational life.

8-2 PERIODIC MAINTENANCE

The only user serviceable part is the fuse located on the rear panel.

If the unit is not operating correctly, please contact our Customer Service Department at (408) 378-6540 for assistance in correcting the problem. Specify the 3100A Generator serial number (serial number tag located on rear panel of unit) when telephoning.

APPENDIX ONE

FRONT PANEL SET-UP WORKSHEET

FRONT PANEL SET-UP WORKSHEET

OUTPUTS _____

MEMORY POSITION	CHANNELS	DE-EMPH	SOURCE/LOAD* OHMS	FSK CODE	LEVEL**	FREQ	WAVEFORM	PTS/ DECADE	DURATION/ TIME MULTIP	BURST TIME ON/OFF	BURST ATTEN
1	A	75	600/600	1545410112	1.2V	400Hz	SINE	-	3 sec.	-	-
2	A&B	75	600/600	1545410132	1.2V	400Hz	SINE	-	3 sec.	-	-
3	B	75	600/600	1545410122	1.2V	400Hz	SINE	-	3 sec.	-	-
4	A&B	NONE	600/600	1545440132	2V	400Hz	BURST	-	-	1sec/10sec	20dB
5	A&B	75	600/600	3545410232	1V	20Hz/20kHz	SINE	10	3x	-	-
6	A	75	600/600	3545410112	.5V	20Hz/20kHz	SINE	10	3x	-	-
7	A	75	600/600	4645411012	-10dB/+20dB	-	IM	60	1x	-	-
8	A&B	75	600/600	1745410032	1V	50kHz	SQUARE	-	.5 sec.	-	-
9	A&B	75	600/600	1945440032	1V	1kHz	SINE/STEP	-	-	2sec/4sec	-
10	B	NONE	600/600	4445412012	-20dB/+20dB	-	IM	10	.1 sec.	-	-
etc.											
80	A	NONE	600/600		8V/.01V	1kHz	SINE	10	12x	-	-

* When front panel set-up is used within an auto-sequence, the load impedance of the first front panel set-up encountered when running the auto-sequence will override the load impedance of all subsequent front panel set-ups chained within that auto-sequence.

** When front panel set-up is used within auto-sequence numbers 9 through 16, the level setting of the first front panel set-up encountered when running the auto-sequence will override the level setting of all subsequent front panel set-ups chained within that auto-sequence.