

Audio Spectrum Analyzer™

Radio Shack

A DIVISION OF TANDY CORPORATION
FORT WORTH, TEXAS 76102

Audio Spectrum Analyzer™ Program Manual:
©1981 Tandy Corporation
All Rights Reserved.

Table of Contents

Introduction
Recommended Input Sources
Starting Up
Real-time and RMS Display Modes
Detail
Peak Hold and Reset.
Freezing the Display
Audio Option
Kaleidoscope Mode
Measuring the Electronic Chain
Measuring the Audio Chain
Summary of Key Commands

Introduction

To the audio purist, high fidelity is a term which means faithful sound reproduction—the sound of "being there." Full, rich, accurate sound—every nuance precisely delineated. The tools to reach this desirable goal have been available for years. Quality amplifiers, tuners, turntables, receivers, and speakers, designed for maximum fidelity are available in almost every price range. All of these come supplied with impressive specifications and overwhelming claims.

But specifications and charts tell only part of the story. How well do these individual parts work together? Audio Spectrum Analyzer can help you achieve the maximum possible performance from your audio investment. It allows you to watch the music, showing you the power distribution of the music, or if you prefer, provides a visually entertaining Kaleidoscope of changing, dancing patterns for hours of relaxation.

The Audio Spectrum Analyzer is designed to analyze a 9 octave audio range, using vertical color bars to represent twenty seven 1/3 octave segments, beginning at 31.5 Hz and ending at 12,500 Hz, using ISO standard frequencies as 1/3 octave points. The center frequencies (in Hertz) are:

| | | | | | |
|------|-------|-------|------|------|------|
| 31.5 | 40 | 50 | 63 | 80 | 100 |
| 125 | 160 | 200 | 250 | 315 | 400 |
| 500 | 630 | 800 | 1000 | 1250 | 1600 |
| 2000 | 2500 | 3150 | 4000 | 5000 | 6300 |
| 8000 | 10000 | 12500 | | | |

The bars are calibrated in dB, referenced to a suitable level for audio input. The measurement level extends from - 20 dB to + 5 dB. It will show a maximum level that is over 256 times louder than the softest measured sound.

Technical Note: Since program sources can vary greatly in average level, the Spectrum Analyzer is designed to scale the range relative to the loudest note that is currently playing. This feature insures the greatest relative deviation will always be shown. Many analyzers will simply cease to show most of the audio range if the signal level drops too low. The Spectrum Analyzer automatically locks onto the loudest note, then shows the response relative to that note.

Recommended Input Sources

| Test | Required Equipment |
|--------------------|---|
| Amplifier Response | 114" Stereo Jack to 118" Miniplug (Radio Shack #274-363) Optional 118" to 118" Extension Cord (Radio Shack #42-2472) |
| Audio Response | Realistic 33-1058 Tie Clip Mike Radio Shack 277-1008A Miniamp |

Audio signals must enter the computer via the black cassette recorder jack. Normal operating range extends from 1/2 watt to 10 watts, at 220 Ohms. Very low impedance sources (8 Ohms and below), such as the direct speaker outputs on your amplifier, can distort your readings and possibly damage your computer.

Use a low level source (e.g. headphone jack, cassette earphone jack, or the output from a low-powered amplifier, such as the Radio Shack 277-1008A Miniamp, which can be driven by a Realistic 33-1058 Tie Clip Mike for room measurements).

Starting Up

Make sure the computer is correctly connected to the TV set and the set is tuned to the right channel (3 or 4). With the computer off, insert the Spectrum Analyzer cartridge in the slot on the right side of the computer. Turn the TV and computer on. The Spectrum Analyzer program title will appear. Press any key to start the program. If you do not press a key, the program will automatically start in about 30 seconds.

Real-time and RMS Display Modes

Press F for the Fast Real-Time response (Peak) mode, to show the instantaneous energy distribution of the music and evaluate the peak energy requirements. The program always starts in the Fast mode. Press S for averaging slow response (RMS) mode, to measure the effect of speaker placement or tone adjustments.

Detail

The display shows the frequencies (in octave steps) near the bottom of the screen. This allows a quick reference to show general frequency distribution and level, showing only octave markers. Press [D] to see the Detailed 1/3 octave display.

The detailed 1/3 octave display allows a complete analysis by displaying all 27 frequency bands simultaneously over the entire 9-octave range covered by the Spectrum Analyzer. Press [D] again to return to the full octave steps.

Peak Hold and Reset

Measuring power is a normally difficult task. Peaks in the music pass very quickly. The Spectrum Analyzer has the ability to lock onto the highest peak level reached in each band. In the Fast mode, you can quickly see which frequencies demand the most power. In the Slow mode, the Peak Hold indicator can show the average distribution of the signal and the general relative response of the system under test.

Press [P] to show the Peak levels in the signal. To Reset the Peak indicator, press the [R] key at any time. You can turn off the Peak Hold function by pressing [P] again.

Freezing the Display

There are times when it is very desirable to be able to analyze a musical passage or one instant in time. Pressing the Space Bar in either mode freezes the display to show the response at the moment the Space Bar was pressed. Pressing any key restarts the display.

Audio Option

When connected to the earphone output jack of a cassette recorder, the built-in speaker in the recorder is turned off. To hear the music under test, there is a feed-through Audio option that lets you hear the signal through the TV sound amplifier. Press [A] for Audio. This feature can be switched off by pressing [A] again. This option can only be set in the Graph mode.

Kaleidoscope Mode

Press [K] for the built-in audio Kaleidoscope (color organ) to produce random changing visual images, keyed to the audio signal's frequency distribution and intensity. Press [G] to return to the Graph mode.

Measuring the Electronic Chain

Connect the black earphone plug to the headphone output jack on your amplifier. Use a familiar record as your measuring tool. All tone altering controls should be set to flat response. Set the volume level to a position slightly louder than most people would consider normal listening level for middle of the road (MOR) music. Set the Spectrum Analyzer to Slow response with the Peak display turned off.

Play the entire selection, adjusting the amplifier volume to show maximum activity on the screen. Setting the level too low will result in relative analysis of low frequencies only, while too high a volume shows only high frequency performance and/or distortion.

After the selection is completed, replay from the start, this time pressing [P] for Peak Hold. Press [R] to reset the Peak indicators just before the music starts. After the selection is finished, the Peak indicators show the maximum average energy reached in each band.

Try replaying the selection, using your tone controls or graphic equalizer to alter the sound. You can now see the effects of your tone controls or equalizer on the music by comparing the new peaks to the original peak indicators.

Measuring the Audio Chain

Try connecting the Spectrum Analyzer to a low-powered amplifier, such as the Radio Shack 277-1008A Miniamp, driven by a Realistic 33-1058 Tie Clip Mike to measure the room and speaker response. Avoid setting the Miniamp directly on your computer (which can throw off the accuracy of the measurements). Do not point the microphone directly towards the speakers (On-axis response). Point the microphone at the ceiling or the floor, but with the body of the microphone in line with the speakers (Incident response).

Try the microphone in various parts of the room. Two excellent test positions would be one meter from the speaker (39 inches), and your normal listening position. Use your tone controls and/or graphic equalizer to try to match the response achieved in the flat position test from the headphone output jack.

Summary of Key Commands

[F] - Fast (Real time) display

[S] - Slow (RMS) averaging display

[D] - Detail On/Off Full or 1/3 octave
[P] - Peak Hold On/Off
[R] - Reset Peak Hold
[A] - Audio On/Off through TV
[M] - Motor On/Off
[K] - Kaleidoscope On
[G] - Graph On from Kaleidoscope
Space Bar - Freeze Display On/Off