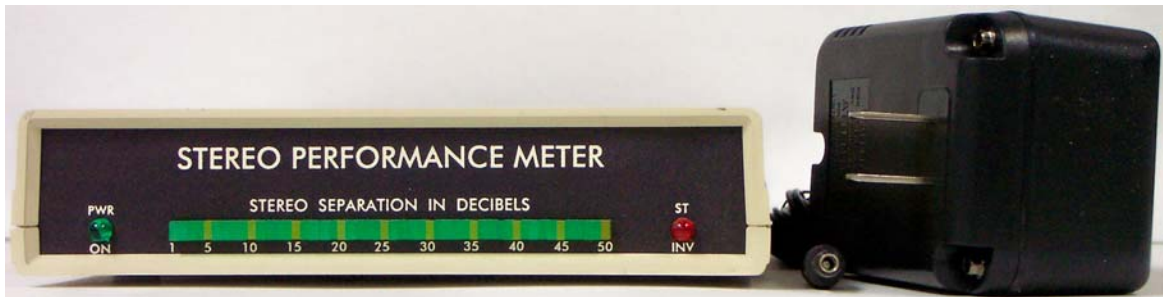


# SPM-1



## STEREO PERFORMANCE METER

OPERATION MANUAL

IB 6244-01

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## 1. GENERAL DESCRIPTION

The SPM-1 Stereo Performance Meter measures the stereo content present in any left and right audio program. This instrument is an entirely new concept in stereo measurement since it actually computes the stereo separation of the Left and Right channels and displays the result on a L.E.D. bar-graph calibrated from 1-50 dB in one dB steps. Polarity inversion is also displayed when the Left or the Right channel is inverted.

In addition to measuring the degree of stereo content of audio programs, the SPM-1 can also measure the stereo separation capability of any transmission or recording/playback system.

The SPM-1 is a fundamentally new type of instrument that assists an audio professional to:

- A. Accurately and quickly set up microphones to optimum positions for a stereo recording session.
- B. Measure and thus establish desired levels of stereo performance during mix-down, post-production, and mastering.
- C. Compare relative loss of stereo performance at various settings of Compressors and Limiters in a stereo FM or TV station.
- D. Instantly distinguish between a stereo performance and accidental dual-mono transmission even when the Left and Right channel are at different levels (note that Modulation Monitors will indicate L-R content even though no stereo exists).
- E. Accurately create any degree of "focus" or "ambience" for singers and instruments during recording or mix-down.
- F. Identify the frequencies causing phasing problems in a recording room.

- G. Optimize BTSC (TV stereo audio) modulators dynamically, using actual audio program material or pink noise instead of steady-state test tones.
- H. Measure actual dynamic stereo performance of stereo transmission systems such as multiplexed Studio-to-Transmitter Links (STL).

## 2. HOW IT WORKS

The SPM-1 contains a Cross Correlation Computer (CCC) that measures and then computes the "crosstalk" between the Left and Right channel. It does this by comparing the phase and amplitude of all components of the complex audio waveform on both the Left and Right channel, then computing the degree of cross-talk present from moment-to-moment. This computation is displayed on a L.E.D. bar-graph calibrated in one dB increments ranging from 1 dB to 50 dB. Zero dB defines complete identity of the waveforms in each channel, indicating a dual monaural signal, while 50 dB indicates almost completely different waveforms in the Left and Right channel. At 50 dB the waveforms have only 0.3% crosstalk and thus the waveforms are 99.7% independent of each other.

The measure of stereo separation (or cross-talk) is completely independent of audio level, however levels in excess of +18 dBm can result in internal signal clipping, causing reading error. Very low operating levels will squelch the display so that stereo separation reading errors will not be induced by the noise that would accompany excessively low levels. Any normal program level on audio facilities operating at 0, +4, or +8 dBm Average Program Level (APL) will be accommodated by the SPM-1. The Left and Right input channels are balanced and bridging so that this instrument can be directly connected across the audio pairs without "loading down" or altering existing program levels.

The "Polarity Inversion" indicator will light when one channel is inverted. This L.E.D. may flash during momentary passages in the music when phasing of recording microphones created a dynamic inversion. When the Inversion L.E.D. is ON continuously, there is a wiring error or perhaps a polarity inversion on the recording medium or playback device.

## 3. STEREO PERFORMANCE; HOW HIGH IS HIGH, HOW LOW IS LOW?

The human ear can discern the difference between 3 dB of stereo separation and monaural sound coming from two speakers, but just barely. Most listeners would regard 3 dB or less to be not much different than monaural sound.

Stereo separation of 4 to 10 dB would be a noticeable improvement over monaural sound.

From about 11 dB to 20 dB the stereo performance would be clearly superior to monaural (and lesser stereo) sound.

Above 20 dB, ranging though 30 and 40 dB the stereo effect is dramatic.

The Above statements refer to the program content as delivered to the listener. A poor transmission system can decrease the quality of the stereo below that of the program source material. Often the perception of

low stereo performance originates from the source, and is not the fault of the transmission system. The SPM-1 can distinguish between these two factors and thus identify the source of poor stereo performance.

Field measurements have shown that the majority of stereo programs produce stereo performance below 15 dB, with many programs registering in the 4-8 dB range.

A few programs, notably, classical concerts and other predominately musical passages may exceed 30-40 dB of stereo separation.

In general, stereo performance tends to be very low where a single singer is heavily emphasized against background instruments because the singer typically uses a monaural microphone and thus monaural becomes predominant.

Using the SPM-1 enables the mix-down of a multiple-track recording to generate any desired degree of stereo separation.

#### 4. OPERATION

Connecting to the SPM-1 is simplicity itself. First place the SPM-1 where you can observe the Left and Right VU meters and the SPM-1 in one glance. Next plug in the "power cube" that comes with the SPM-1 into a 115 VAX wall socket and connect the DC cord to the SPM-1. The green PWR ON light should go on. Remove the 6-pin connector block from the back of the SPM-1 by gently pulling out with a sidewise rocking motion. Connect Tip, Ring, and Ground wires to the screw-terminal block as depicted on the rear panel. The other end of those wires may go to T,R, S patch plugs or wire directly across the output Left and Right pairs of an audio console. Plug the screw-terminal back in until a click is felt.

The SPM-1 can handle any 0, +4, or +8 dBm balanced audio level by simply bridging the SPM-1 across the Left and Right audio lines. The meter will begin to display stereo separation when stereo programming is present. If no display occurs, the program is either off or monaural (below 1 dB) or the wiring is incorrect. If there is a stereo measurement display and the red ST INV light is continuously on, check the wiring for a possible TIP-RING polarity inversion. To correct, reverse the TIP and Ring of only one pair, not both. If you are certain the wiring of the SPM-1 is correct, then suspect the wiring back to the audio source, the wiring of the playback mechanism, or even incorrect polarity in the recording tracks. Occasional flashing of the inversion light indicates dynamic inversion of the program material. This condition is most likely to occur on recordings with very high stereo separation where many microphones are in use, especially where they are widely separated such as recorded classical concert music. In this case, the inversion light may flash on as much as one-half of the time.

The measurement of stereo separation is quite accurate, being within 1 dB up to 35 dB separation and within 2 dB from there to 50 dB.

Since the SPM-1 measures cross-correlation between the Left and the Right channel stereo tests may be performed with a program audio source, pink noise, or test tones with equal facility.

In addition to measuring the stereo content of a program source, the SPM-1 can also measure the crosstalk injected by a stereo multiplexer or other stereo transmission or recording equipment. To measure the stereo capability of transmission or recording equipment it is only necessary to transmit one channel at a time (either the Left or the Right channel). To do this, kill the Left channel at the source while sending program on the Right channel. Repeat by transmitting only on the Left side. Observe the display on the SPM-1 for each test. Note that the two readings may be quite different, indicating greater cross-talk from one side than the other. This test indicates the highest stereo performance that the system can transmit. The actual program that is then transmitted when both channels are connected may well be very much lower in stereo separation (depending on program content) than the capability of the transmission or recording facility.

Measurement of the stereo content of music is entirely new and unique to this instrument. While meters that measure Left-minus-Right have been available for some time, such devices do not measure stereo separation. Since this device is based on an entirely new concept and actually does measure stereo separation in Left and Right program material, many new applications are being discovered. Apply what you learn while using the SPM-1 to new areas of performance measurement. We are trying to compile these new applications and techniques and will be writing articles for various trade journals. Please call us at 800-235-6960 when you come up new ideas that may be useful to others in your field.