GOLD LINE

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AUDIO SPECTRUM ANALYSIS SYSTEMS

INPUT SENSITIVITY: The input sensitivity of the Type 10 Audio Spectrum Analyzers can be adjusted over a considerable range to match many different conditions and sound pressure levels (SPL). With model Number ASA-10, the sensitivity is adjusted with the Gain Control. With *GAIN* at minimum (knob rolled down), the analyzer gives a 0 dB indication at about 105 dB SPL. With *GAIN* at maximum (knob rolled all the way up), the 0 dB indication is at about 65 dB SPL. When making a measurement, if there is no display, increase the gain (or turn up the amplifier). If the clipping indicator is on, reduce the gain (or turn the amplifier down).

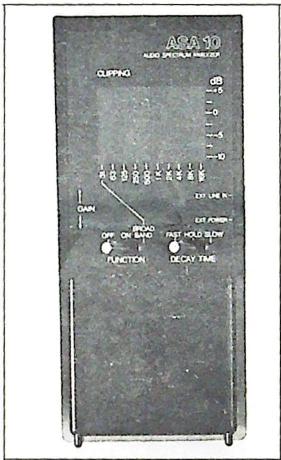
The sensitivity of the ASA-10B is controlled with the eleven position *INPUT SENSITIVITY SWITCH* which provides ten 5 dB steps from 70 to 120 dB for a 0 dB indication. The *INPUT GAIN* switch can be set for 0 dB, or for −20 dB gain which increases the maximum sensitivity to 50 dB. In normal operation this switch would be kept at 0 dB, except when needed for SPLs below 70 dB. Keep in mind that the displayed SPLs are actually 20 dB below the *INPUT SENSITIVITY* setting when *INPUT GAIN* is at −20 dB. The *INPUT GAIN* switch also turns the analyzer off.

The ASA-10 is turned on and off with the *FUNCTION SWITCH*. In *ON*, the analyzer is set for normal operation, and the sound energy will be shown in the display for each of the ten filter bands, from 31.5 Hz to 16 KHz. With the ASA-10 *FUNCTION SWITCH* on *BROADBAND*, the 31.5 Hz display channel is used to indicate the average relative SPL (sound energy across the entire audio band).

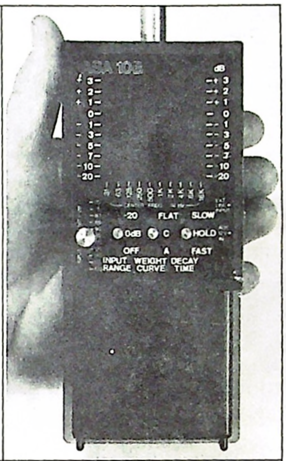
The ASA-10B has three frequency response functions which are selected with the *WEIGHTING* switch. In *FLAT*, there is no shaping of the response, and all ten filtered channels are operating normally. In *C/SPL*, C type weighting is applied to the entire display, and the left-most display channel is switched from 31.5 Hz to broadband to show the overall level in dBC. In *A/SPL*, A type weighting is used, and the left-most channel shows level in dBA. The selection of a weighted curve for a particular measurement is generally predicated on the type noise to be measured. As an example curve "A" is often employed when making *speech interference measurements*. "C" is more often used for music and environmental noise measurements.

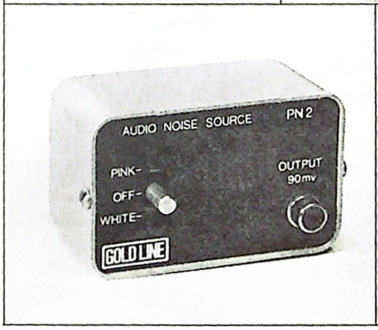
DECAY TIME: The *DECAY TIME* switch functions are the same for both the ASA-10 and ASA-10B models. In *FAST*, any level indication at 0 dB will fall to −10 dB in from 2 seconds (31 Hz) to 0.5 seconds or less (500 Hz and above) if the sound is turned off. In *SLOW*, the decay or fall time for 10 dB is about 20 seconds at 31 Hz, decreasing to about 6 seconds at 500 Hz and above. The response to a sudden increase in level, the attack time, is short in both *FAST* and *SLOW*. When monitoring music or speech, and you want to see the rapid level changes, use *FAST*. If you are going to use pink noise, *SLOW* must be used to be a steady, stable display on the analyzer. *HOLD* is used to capture the display of a particular moment, from *FAST* or *SLOW*, providing time to make notes on the display.

ASA-10

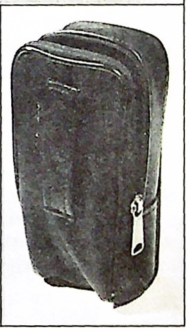


ASA-10B





PN-2



ASAC

The DISPLAY: The display of the Type 10 analyzers provides valuable information which has been processed with the analyzer's circuitry. *The ASA-10 display* consists of a matrix of 70 LEDs: a column for each of the ten filter bands, and 7 LEDs in each column for 2.5 dB steps from −10 dB to +5 dB. When the level in any one of the ten filter bands is higher than the upper limit for the +5 dB indication, the *CLIPPING* LED will come on. If this happens, reduce the analyzer gain or the sound system volume to get in-range indications. Each row of LEDs have precise thresholds to ensure and accurate indication of sound energy in each of the bands.

The ASA-10B Display is a matrix of 100 LEDs: a column for each of the ten filter bands, and 10 LEDs in each column with a VU meter type scaling with turn-on thresholds at −20, −10, −7, −5, −3, −1, 0, +1, +2, and +3 dB. This arrangement obtains a wide display range with better resolution where most needed.

If using the analyzer inside under bright lighting conditions, try to position the unit to minimize the effects of any light reflections. Add some display shielding for measurements outside, but make certain not to block the microphone in the end of the analyzer.

THE MICROPHONE: The microphone in the end of the ASA-10 is behind a screen to protect it from damage. The microphone of the ASA-10B is positioned clear of the end of the analyzer case to minimize shielding effects. The ½-inch microphone diameter of the ASA-10B facilitates checking SPL calibration with an acoustical calibrator, such as made by Gen Rad and others. *NOTE: The ASA-10B has been calibrated by the factory—but can be field calibrated.*

TO CALIBRATE: set the *INPUT SENSITIVITY* to display 0 dB as close as possible to the SPL generated by the calibrator. (*Input GAIN* should be at 0 dB). Adjust *SPL CAL* (trim pot accessible with back removed) for the correct indication for the particular calibration used.

THE EXT (AUX) LINE-IN JACK: This jack is for connecting line-level signals for analysis. A 0 dB indication on the ASA-10 will occur over the range from 20 millivolts (0.020V) to about 0.8V (−32 to 0 dBM), depending upon the setting of the gain control. A 0 dB indication on the ASA-10B will be obtained from 0.43 millivolts (0.00043V) to 1.94V (−85 to +8 dBM), depending upon the *INPUT SENSITIVITY* and *INPUT GAIN* settings. The microphone is automatically disconnected with plug insertion. The input impedance is 33K ohms for the ASA-10 and 10K ohms for the ASA-10B. The plug type is Switchcraft 780 Tini-Plug.

POWER

EXT (12V) POWER JACK: The Type 10 Analyzers are normally powered with eight AA cells, and this is the most convenient arrangement for hand-held measurements. The cells can be either alkaline or NiCad rechargeable, however, *do not use* any "regular" carbon-zinc types. At a nominal 12 volts, the current drain is about 40 mA (milliamperes) with no LEDs on the display to about 80 mA with an LED on each filter band. If the units are to be used in stationary positions, it will be worthwhile to power the analyzers with an external supply or battery eliminator, such as the Gold Line model BE-1. (Source requirements: at least 80 mA at 8-15 volts, 12 volts nominal. Matching plug is Switchcraft 850 Micro-Plug.) Please note that with the ASA-10, plugging in a battery eliminator automatically disconnects the internal batteries and any NiCad batteries installed must be removed if there is a need for recharging.

With the ASA-10B, there is an internal switch (accessible with the back removed) which must be set for the type of batteries used. In *alkaline*, the use of a battery eliminator removes the internal batteries from the circuit. In *NiCad*, the batteries remain connected and are recharged by the external power supply.

Access to the batteries is gained by removing the four screws holding on the back case. Replacement (or NiCad recharging) is required when there is a noticeable drop in the brightness of the LEDs in the display.

SCOPE OUTPUT: As an aid for troubleshooting and certain types of analysis, the ASA-10B has *SCOPE OUTPUT* connections with *OUT* (vertical), *SYNC* and *GND* (accessible by opening the back) where indicated. The scope display will show the levels in the ten filter channels as linear voltage functions, actually roughly correlated to the ASA-10B VU type display.

PN-2 AUDIO NOISE SOURCE: This pink/white noise generator is a very desirable accessory for use with the *TYPE 10* analyzers. It is, in fact, an essential tool for running many tests on sound systems and their components. It has both pink noise and white noise outputs, selected with a toggle switch. The output levels are approximately 90 mV RMS for pink noise and 120 mV RMS for white noise. Adjustment of equipment drive levels must be made external to the unit. White noise has an equal amount of energy in every Hz of bandwidth. For example, there would be equal energy from 20 to 21 Hz as there would be from 20,000 Hz to 20,001 Hz. This characteristic is most useful with what are called constant Hz-bandwidth analyzers, which most swept-spectrum analyzers are. White noise is easily shaped or filtered to make pink noise which has equal energy in each octave of bandwidth (or in each fraction of an Octave). For example, there is equal energy in the octave centered at 125 Hz and in the octave at 2 KHz, or any other within the limits of the generator. Pink noise thus produces a flat response in constant-percentage-bandwidth analyzers such as the Gold Line analyzers and other RTAs (real time analyzers). The spectrum of pink noise also approximates that of much music with less power per Hz (−3dB/Octave) with increasing frequency. This makes it an excellent test signal for sound systems, where white noise could burn out tweeters. At lower levels, white noise can be used for critical listening checks and some other tests, but pink noise is much more useful, in general.

GENERAL GUIDELINES FOR USE OF THE TYPE 10 ANALYZERS

The sound energy in each of the ten octave bands is shown simultaneously and continuously—that is RTA or Real Time Analysis. Many tests are most easily run using a pink noise source (Gold Line model PN-2) which puts out equal energy across each filter band. If it is fed directly to the unit the result will be a straight-line display. With the pink noise fed through a sound system, any deviations from flat response will be shown on the analyzer. The accuracy of a reading with pink noise will be improved by mentally averaging any level variations noted. Point the analyzer at the speakers keeping it away from the body for best accuracy. If outside, or the room permits, keep *at least* 20 ft. away at 31.5 Hz, 10 ft. away at 63 Hz, etc. Room effects may prevent following these guidelines. For actual SPLs, switch the ASA-10B to *C/SPL* or *A/SPL* for levels in dBC or dBA weighting.

SOUND SYSTEM EQUALIZATION: Because the

Type 10 Analyzers have their own built-in microphones, you can measure the sound output from any type of sound system: high fidelity, band or sound reinforcement. The response will be shown in the ten filter-band display whether the tests are made in a room, at a club, or even outdoors.

Procedure:

1. Turn off the sound system before making connections, and put *all* tone controls, EQ etc., to their flat positions. Set volume to zero.
2. Connect the PN-2 to a line level input to one channel *only*.
3. Turn the amplifier/system and noise generator on to *PINK*.
4. Advance the volume to a medium-high sound level. Do not overdrive.
5. Set both the ASA-10 and ASA-10B at *SLOW* decay time with low gain/sensitivity and turn it on. Additionally set the ASA-10B on *FLAT*.
6. Take a position in the center of the listening area.
7. Increase the gain of the analyzer to put the majority of the filter band responses near 0 dB. Make certain the unit is pointed at the speaker. Take note of the levels in each of the octaves.
8. In the lowest bands there can be great deviations from flat response caused by speaker and room characteristics. Usually it is impossible to make the changes in room shape and size that might be desirable, but changes in speaker position are usually quite feasible.
9. If inside, try different speaker positions along and up and down the back wall, and also try various distances from the wall. Use the combination that gives the best result, i.e., the flattest response, especially at the low-frequency end. Move around in the listening area to see if there are measurable room effects appearing in the lowest filters. Make certain the sound level from the system is high enough to cover over the normal room ambient noise.
10. The high-frequency response of the system will be greatly affected by the speaker's *angular* positioning—how it is pointed back and forth and also up or down. Make such adjustments as necessary for maximum output in the highest frequencies.
11. After completion of the above two steps, move around in the listening area while observing the analyzer display. Take note of any large shifts in the response. *HOLD* may help making comparisons.
12. Adjust the systems equalizers, tone and tweeter controls, etc., to obtain the flattest response in the listening area. Do *not* try to boost out deep notches in the response, such as might be caused by a poor crossover. In general, limit the amount of boost used in order to prevent overdriving amplifiers and speakers. *Do* use cut to bring down peaky areas. To the extent possible, use tone controls or other broad, shelving-type EQ to minimize the need and extent of narrow-band EQ.
13. Recheck system response with the analyzer, and trim adjustments for the best compromises over all the bands and for all important listening areas.
14. Repeat steps 6 to 13 for the other channels.
15. With both channels driven equally (balance control centered), touch up low-frequency EQ for flat performance in listening area up to 250 Hz.
16. The liveliness in a room will have an effect on the system response, primarily in the medium and high frequencies. Rugs, stuffed furniture, drapes and people are all absorbers of sound, and acoustically dead rooms require more sound from the speakers, with a need for more boost of medium/high frequencies.
17. **CAUTION:** Do not use extreme amounts of bass boost with small speakers. *Destruction* could be the result. Try to find the best speaker-wall distance to minimize the need for the boost.

ELIMINATING FEEDBACK

(For Band or Other Sound-Reinforcement Systems)

Procedure:

1. Feed pink noise (such as from *GOLD LINE PN-2*) into a line input, and set volume for a medium-high level from the speakers.
2. Turn up gain on main microphone input until feedback just starts.
3. With the analyzer, look for evidence of one filter band peaking above all of the others. Increase level if necessary.
4. Adjust equalizer to put in just enough cut in that band to stop the feedback. A parametric EQ should be set at minimum bandwidth.
5. Increase level and continue to trim EQ to control feedback.
6. When second feedback frequency appears, use analyzer to determine the adjustment needed. Increase level further, and trim EQ.
7. When there is feedback appearing at three or more frequencies with further increases in level, the practical limit of feedback control with minimum effect on the music has been reached. The adjusted system will have higher output and be easier to operate.
8. Open other mikes that will be on at the same time, and change settings as needed for best overall performance.
9. For the final adjustment, performers should stand at the microphones in normal performing position as their proximity can cause some shift in feedback modes.

TAPE RECORDER ALIGNMENT

Procedure:

1. Clean and demagnetize all heads.
2. Connect one channel of the recorder output to the analyzer *EXT (AUX) LINE IN*. Turn analyzer on with decay-time switch on *SLOW*.
3. Play a pink-noise alignment tape (This must be of high quality!) with the recorder monitor switch on Tape. Adjust analyzer gain and/or recorder output level for a display at 0 dB.
4. Following the recorder manufacturer's instructions, adjust the azimuth of the play head for maximum output in the 16-kHz channel.
5. If the display is erratic, check for proper tape wrap and head tilt. Adjust if necessary, and repeat azimuth check.
6. If there are play equalization adjustments, make these while observing the effects on the levels in all ten filter channels.

7. Change output connections and check alignment on other tracks.
8. Make play equalization adjustments similarly for all other tracks.
9. Repeat steps 2 to 8 for other tape speeds if necessary.
10. If a pink-noise alignment tape is not available, a discrete-tone test tape can be used, although it will be less convenient. Just use whichever analyzer channel covers the tone on the tape.
11. Select tape type and length most frequently used, and set the bias and EQ switches to correspond. Select tape speed.
12. Feed a pink-noise generator, such as the *GOLD LINE PN-2*, to the recorder line input. Set record level to −10 VU for open-reel recorders at 7½ ips and to 20 dB below Dolby reference level for cassette decks.
13. If the unit is a three-head machine, record the pink noise, and simultaneously monitor the playback output with the analyzer. First, adjust the record head azimuth for maximum output in the 16-kHz band. If the bias is adjustable, reduce it to near minimum, and then increase it slowly. Stop where the outputs in the 500-Hz and 1-kHz bands reach a maximum. Trim the high-end response with record equalization, if possible. A fine bias adjustment can be made to get the best overall record/playback response.
14. Check the results on other tracks, making necessary adjustments.
15. Repeat adjustments for other tape speeds and tape types, if need be.
16. If the recorder is a two-head unit, the approach is similar, but it is necessary to record, rewind and play after each adjustment is made. Make small changes to facilitate removing any errors made.
17. If the heads are worn, the responses may be down noticeably at 16 kHz. Even so, you will still want to adjust the heads for the maximum output. However, Bias and EQ adjustments will provide limited correction in this case. Do not reduce bias so much as to decrease the 500-Hz level (*and increase distortion*) in an effort to try to force the high end up.
18. You will find that alignment with the analyzer and pink noise is *much* faster and better than other methods. Dolby tracking is also very easy to check with the analyzer.

OTHER EQUIPMENT TESTS: By using the line-input capability of the analyzer, sometimes in combination with measurements with the microphone, it is possible to pin down the response of tone controls and equalizers *before* feeding to the loudspeakers. Looking at the output of preamps, mixers and other line level devices is very easy with the Type 10 Analyzers. It is also possible to connect the analyzer to the output of a power amplifier, but BE CAREFUL! First of all, make any connections with the power amplifier turned off. Make certain that the amplifier, or the control section feeding it, is set to minimum gain. Power amplifiers can put out voltages that are much higher than the maximum level handled by the analyzers, so extra caution is in order. Set analyzer gain/sensitivity to minimum: *ASA-10* with the *GAIN* knob rolled down, and *ASA-10B* with the *INPUT SENSITIVITY* at *120 dB* and *INPUT GAIN* at 0 dB. Increase amplifier gain very slowly until the display is close to 0 dB, where further adjustments can be made.

IN SUMMARY: The application of audio spectrum analyzers such as the Gold Line models ASA-10 or 10B is continually being broadened. Your own imagination may suggest some of the new areas of use for these versatile instruments.

COMPARE SPECIFICATIONS YOURSELF!

	ASA-10	ASA-10B*
Measurement Range	65-100dB SPL	30 to 123dB SPL
Display Channels	10	same
Center Frequencies (Hz)	32, 63, 125, 250, 500, 1K, 2K, 4K, 8K & 16K	same
Center Frequency Accuracy	Typically 3%	Typically 3%
Relative Flatness Channel to Channel	±1.0dB	±1.0dB
SPL Display (Broadband)	Relative A level in one channel with relative spectrum display in all other channels	Absolute A or C level in one channel with relative spectrum display in all other channels
Weighting	IEC A Weighting	IEC A or C
Detector Decay	In 500Hz channels 2.2dB/Sec in Slow, 18dB/Sec in Fast	same
Hold Function	Freezes display for later reading	same
Display Range	15dB in 2.5dB steps	23 dB range, VU Scale with 11 position switched attenuator in 5dB steps
Microphone	Omni Electret condenser	same
External Input	−32dBm to 0dBm	−85dBm to +8dBm (.043mV to 1.94V)
Input Impedance	33Kohms	10Kohms
Power Supply	8 AA Alkaline Bat or external input 8-15v d.c. 8ma from optional dc supply	Option of Alkaline or NICAD rechargeable Bat can be recharged w/ext. power input

**ASA-10 B&C are identical in all aspects except for physical dimensions.*