

System 824 Virtual Instruments

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The System 824 presents a number of distinct “virtual instruments” enabling you to select the mode best suited to a particular application. You can, of course, create new setups for particular applications and add your own IDs to the System 824.

The SLM&RTA (SSA), Logging (LOG) and Integrating SLM (ISM) instruments are available in various 824 configurations. The table on the next page explains each of these instruments and shows the configuration in which it is available.

The following configurations of the System 824 are available:

- 824S, 824A, 824L, 824

The following options are also available:

- 824-RTA
- 824-FFT
- 824-AUD
- 824-TAL

The table below describes the basic functions of each configuration.

Instrument	824S	824L	824A	824	824-RTA	824-FFT	824-AUD	824-TAL
ISM - Integrating SLM measures LEQ, SEL, Min, Max, Peak, with all weights (A, C, Flat) and with all detectors (slow, fast, and impulse) simultaneously. Includes a high and low measuring range.	√	√	√	√				
SSA - Sound spectrum analyzer measures LEQ, SEL, Min, Max, Peak, with all weights (A, C, Flat) and with all detectors (slow, fast, impulse, peak and Leq) simultaneously plus 1/1 and 1/3 octave data stored in time and interval histories at storage rates as fast as 8 times per second. Included are Ln data showing 6 Ln values, a graph of L1 through L99 (broadband) and spectral Lns. Wind and Tach data with external transducers.			√	√				
LOG - Logging SLM measures LEQ, SEL, TWA, Min, Max, Peak, with all weights (A, C, Flat) and with all detectors (slow, fast, and impulse) simultaneously. Includes time history, interval history, exceedance history, daily history, Ln percentiles, statistical data, exposure, and dual SLM (current and overall). Wind and Tach data with external transducers.		√		√				
RTA - High speed spectral data gathering of up to 400 spectra per second using Autostore function. Spatial averaging of any number of spectra. Flexible triggering for data acquisition. Performs RT60, RC NCB, HTL. Exponential and linear detectors.					√			
FFT - 400 line FFT with Hanning, Flat-Top or Rectangular window, snapshot data storage, display zoom with a factor of 2, 4, or 8. Count averaging (1 to 16384), measures THD. Linear units can be user defined.						√		
AUD - Audiometer testing for level, frequency, linearity, THD, pulse, crosstalk, frequency modulation, narrow band, broadband, and speech noise.							√	
TAL - Performs complex tonality calculations required by DIN 45681. Measures the frequency of a dominant tone (F_T), the level of the tone (L_T), the bandwidth of the tonal group (F), the level of the group (L_G), and difference of the two levels ($L_T - L_G$). SLM measures L_A , L_C , L_{Aeq} , L_{Amax} , L_{Cmax} , L_{AFM5} , L_{95} , and L_{Ceq} - L_{Aeq} . A snapshot history is provided to store and display data from the various modes.								√

This chapter will discuss how to select an ID in addition to providing an explanation of the features of the currently available IDs.




Selecting an Instrument ID

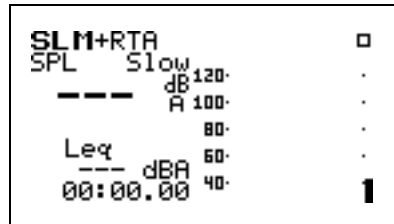
To select one of the System 824 instrument setups or IDs, do the following:

There will be a '>' to the left of the currently enabled instrument ID. The current ID will generally also remain at the top of the list. If the user changes the ID that is in use, the current ID will then have an asterisk to the left of the title.

Step 1 Press the  SETUP key. A menu similar to the following appears:



Step 2 Select the desired ID from the menu by using the  or  keys to highlight it, then press the  key to select it. That instrument's main display will appear:



Sound Spectrum Analyzer (SSA)

There are applications which call for the simultaneous measurement of both the sound pressure level and the real-time frequency spectrum. Very often you will wish to measure the weighted (A, C or Flat) sound pressure level while simultaneously measuring the unweighted frequency spectrum.

For these applications, the System 824 provides the *SSA* instrument.

With this instrument the SLM and RTA functions are operating simultaneously. The primary indicator range of the SLM function is 80 dBA, sufficient for most applications.

In operation, the instrument measures four sets of frequency spectra; the running instantaneous spectrum, the L_{eq} spectrum, the spectrum associated with the maximum SPL level that occurred during the measurement and the minimum bin by bin spectrum. It also gives you a time history record and Ln centiles. The time history record stores up to 38 parameters of your choice, including RTA Leq, RTA Max, or RTA Min, which is determined by the Time History setup under the settings menu.

SSA Measuring Ranges

By using a 24-bit DSP processor, the digital filters of the System 824 meets the specifications of IEC 61260 - Class 1 and ANSI S1.11-1986 Type 1-D over a linearity range exceeding 80 dB. The dynamic range of the analysis function, from noise floor to overload, is 85 dB (typical). Eight ranges are available, providing gain to +50 dB and attenuation to -20 dB in 10 dB steps.

The following presents the Measuring Ranges available for SPL, Peak and 1/3 Octave Filter measurements for the SSA instrument:

Measurement Range (SSA mode only)

	0dB Gain				10dB Gain				20db Gain				30dB Gain				40dB Gain				50dB Gain			
	NF	Start	End	Range	NF	Start	End	Range	NF	Start	End	Range	NF	Start	End	Range	NF	Start	End	Range	NF	Start	End	Range
AW	33	48	128	80	24	38	118	80	15	28	108	80	8	23	98	75	7	20	88	68	6	20	78	58
CW	32	48	128	80	23	38	118	80	16	28	108	80	9	23	98	75	8	20	88	68	8	20	78	58
FLT	32	48	128	80	25	38	118	80	21	33	108	75	21	33	98	65	26	33	88	50	23	40	78	38
16.0	2	45	128	83	2	35	118	83	1	25	108	83	2	25	98	73	-1	28	88	60	1	23	78	55
31.5	3	43	128	85	1	35	118	83	1	23	108	85	2	25	98	73	-4	22	88	66	-4	23	78	55
63.0	4	40	128	88	0	33	118	85	1	23	108	85	0	22	98	76	-7	15	88	73	-7	18	78	60
125	2	40	128	88	-2	27	118	91	-3	28	108	80	-2	18	98	80	-9	11	88	77	-8	8	78	70
250	3	37	128	91	-3	25	118	93	-3	15	108	93	-4	15	98	83	-10	8	88	80	-9	8	78	70
500	12	33	128	95	4	25	118	93	-3	15	108	93	-4	13	98	85	-10	6	88	82	-10	8	78	70
1000	10	32	128	96	2	20	118	98	-4	15	108	93	-5	13	98	85	-10	6	88	82	-10	8	78	70
2000	15	32	128	96	6	20	118	98	-2	15	108	93	-5	13	98	85	-8	8	88	80	-8	8	78	70
4000	14	32	128	96	7	20	118	98	0	15	108	93	-2	13	98	85	-6	8	88	78	-6	8	78	70
8000	14	32	128	96	7	20	118	98	1	15	108	93	-1	13	98	85	-2	12	88	76	-3	13	78	65

*NF is noise floor

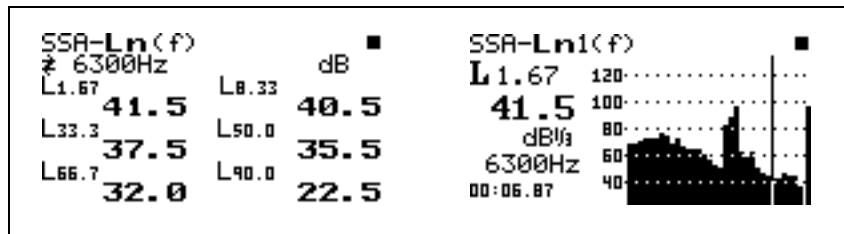
Start = start of linearity range

A-weighting, C-weighting, and Flat are measured to ANSI S1.4 and IEC 60651 standards for SLM linearity. 1/3 octave filters listed are measured to the IEC 61260 standard for Class 0 linearity which is ± 0.3 dB. The numbers in the table represent SPL levels with a typical

L_N Percentiles (Spectral)

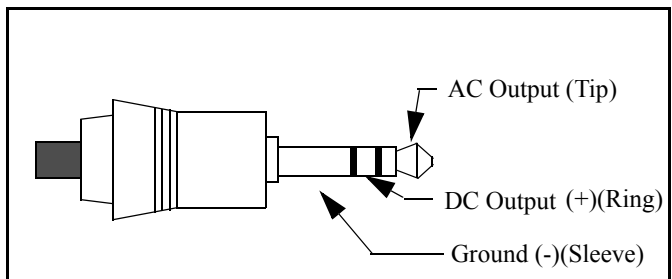
The System 824 L_N Centiles feature provides a display showing the six L_N values of one selected 1/3 octave filter.

It also displays spectra for the six L_N percentiles.



AC/DC Output

The AC/DC output on the 824 is through the 3.5mm stereo connector at the bottom of the instrument. This is a 2-channel output. A mono plug should NOT be used, it will short the “ring” signal to ground.



The two possible output signals are on the tip and the ring of the 3.5mm jack. The sleeve is ground. The selection in the 824 controls settings lists the signal output on the tip first, followed by the signal output on the ring. The AC output signal is always amplified or attenuated by the gain or attenuation selected for the instrument. For example, if one were using an SSA instrument with 20dB of gain, the AC output would also have 20 dB of gain from the input*.

**Also take into account a gain of approximately -0.25 dB in the PRM902 preamplifier.*

The DC output voltage is proportional to the SPL specified by the weighting setting according to this formula

$$SPL = ((V_{out})/0.0275) + StartLevel$$

StartLevel is a setting on the Ln settings menu. DC out has a range of 120 dB.

The output signals will vary based on which instrument type is used. For LOG and ISM instruments, the following table defines the output signals.

LOG and ISM Instrument AC and DC Output Settings		
824 Menu	3.5mm Connector Tip (Black)	3.5mm Connector Ring (red)
AC-1 AC-2	FLAT AC out	FLAT AC out with 30dB gain
AC-1 DC	FLAT AC out	Weighted DC out
AC-2 DC	FLAT AC out with 30 dB gain	Weighted DC out
AC-2 AC-1	FLAT AC out with 30 dB gain	FLAT AC out

For SSA instruments, the following table defines the output signals (output amplitude based on input **Gain** setting).

SSA Instrument AC and DC Output Settings		
824 Menu	3.5mm Connector Tip (Black)	3.5mm Connector Ring (red)
AC-1 AC-2	FLAT AC out	CWT AC out
AC-1 DC	FLAT AC out	Weighted DC out
AC-2 DC	CWT AC out	Weighted DC out
AC-2 AC-1	CWT AC out	FLAT AC out

The DC output is generated digitally from the SPL but is slower than the SLOW or FAST detector response with an exponential time constant of approximately 2.25 seconds.

For the AUD instrument, AC-1 is on the tip and the DC output is not used.

For the RTA instrument, the AC signal will be identical on the tip and ring.

Logging SLM

The **Logging SLM (LOG)** instrument is ideal for applications requiring the automatic measurement and storage of multiple parameters over an extended period as required for environmental noise monitoring. The Logging SLM provides automatic logging of sound level parameters including Interval data, L_n statistics, noise event detection and event time history records. Additionally, this mode provides a dynamic range of 115 dB.

Like other instrument modes, the Logging SLM mode is selected via the **Setup** menu. This section covers some of the data acquisition features of the **LOG** instrument.

Time History

The System 824 Time History logs L_{eq} readings and up to 37 additional parameters. The Time History graphical display allows you to scroll through the time history and Run/Stop events.

Interval History

The following Interval History parameters can be logged at user-selectable time intervals between 1 second and 99 hours (hh:mm:ss)

- L_{max} , L_{min} , SEL, and L_{eq} (q=3) or Time Weighted Average (q=4, 5, or 6) levels for a selected detector (Slow, Fast, or Impulse) and a selected frequency weighting (A, C, or Flat)

- L_{peak} level corresponding to the frequency weighting selected for L_{eq} (see above) and a second L_{peak} level corresponding to one of the two alternative choices of frequency weighting.
- L_n (6 values with 0.1 dB resolution, based on user-selected percentages with 0.1% resolution)
- Date, Time and Duration of Interval
- Average and maximum wind conditions (using external windspeed/direction transducers)

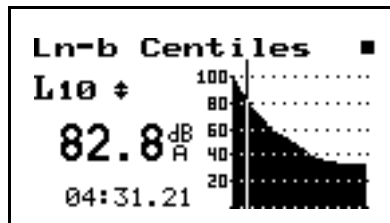
Exceedances

The 824 can log exceedance events based on sound levels that go over a predefined threshold. It can also be triggered by an event which raises the level by 10 dB. This is called a “Passby” event.

L_N Percentiles (Broadband)

The System 824 L_N Centiles feature provides a set of six percentile values to be measured and shown in the “ L_N Centiles” display. Using these six settings, you can select any six percentile values. For example, setting one of the six settings to 10.5 would show the SPL that has been exceeded 10.5% of the time during the time of overall measurement. These settings can each take on any value within the following range:

.01 to 99.99



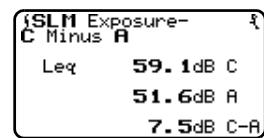
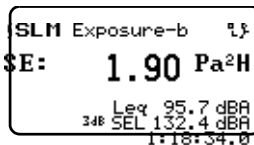
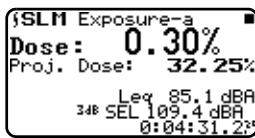
Sound Exposure

The System 824 lets you set the criteria level and criterion time for Dosimetry measurements. A 100% dose occurs if a person is exposed to a constant sound field with a SPL equal to the criterion level, for the criterion time or full dose hours. The criterion level setting can take on any integer value within the following range:

0 to 255 dB

Exposures at higher sound exposure levels than the overall criterion level will result in a 100% dose in less time; or, if exposure continues, the overall dose will exceed 100%.

The following are examples of the System 824 Sound Exposure displays:



LOG and ISM Measuring Ranges

The following table presents the typical RMS detectors measuring ranges for the LOG and ISM instruments:

Range	Frequency Weighting		
	A	C	Flat
Low Range	20–108 dB	25–108 dB	25–108 dB
Normal Range	23–128 dB	28–128 dB	30–128 dB
High Range	43–148 dB	48–148 dB	50–148 dB

NOTE: Ranges are in dB SPL using a typical 377B41 microphone with 44.1 mV/Pa sensitivity. See "RMS Measurement Range (LOG and ISM modes only)" on page C-11 for more 824 specifications.

The LOG and ISM instruments have a dynamic range of 105 dB.