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Miscellaneous Information

This appendix contains additional information about the 824 in the form of questions and answers.

Question #1

How can I delete the Instrument Definitions (ID) in the Setup menu that are labeled permanent?

Answer

There are ten permanent IDs that come with the 824 that are the factory default settings for the various instruments in the 824. They are there as a starting point from which to make your own Setups and cannot be deleted. Modify each one that you need and then save that ID with your own unique name.

You may test drive or demo any of the non-purchased permanent SETUP options. Up to 20 demos are available if the instrument is reset (press RESET > Reset Options > Purge All Data Files). Data cannot be stored, downloaded or printed but may be viewed on the display.

You can, however, separate the permanent IDs from your own custom IDs with a special ID whose name is all underscore characters. Your setup menu could look like this:

You can have as many as 50 custom SETUPs besides the 10 permanent setups.

```
1)    Slow-A  ISM      Integrating SLM set to Slow A weighted SPL
2)    Fast-C  ISM      Integrating SLM set to Fast C weighted SPL
3)    My      ISM      Integrating SLM with my personal preferences
4)    My      SSA      Customized SSA with my personal settings
5)    5s_Hist SSA      SSA with time histories set for 5 seconds
6)    _____  ISM      (dividing line setup, not used otherwise)
7) p  SIM&RTA SSA
8) p  SLM     ISM
9) p  AudTest AUD
10) p demo    LOG
11) p ROOMS   RTA
12) p FFT     FFT
13) p Logging LOG
14) p RT60B   RTA
15) p TA-LARM TAL
16) p RT60-A  RTA
```

Menu items 1 through 6 are custom IDs. Note that for ID number 6 underscores were used as a separator to put a break in the list between the permanent settings and the user setting. The list is sorted by what is used most often so if a permanent ID is used it will be seen above the line. In other words, the IDs that are used most often float to the top of the list and those that are not used sink to the bottom.

Hint: *To make the underscore filename easily, do the following:*

1. Recall an ISM instrument (or any other ID as desired).

2. Press SETUP and highlight the top line, "Edit Settings", and press the TOOLS key.

3. Highlight the top line, "Save ID", and press the check key.

4. A window pops up labeled "ID Name".

5. Press the RESET key to clear the old name.

6. Push the right arrow key seven times to get to the last name character.

7. Press the down arrow key about eleven times until the underscore character is showing.

8. Press the check key.

9. Now recall all of the IDs that you want to be above the separator line.

Question #2

What is the power or current drawn by the 824 through the external power jack?

Answer

Here is a sample of external power expectation showing both wattage and current:

|		Off	Stopped	LOG Running with backlight OFF	LOG Running with backlight ON	SSA Running with backlight OFF	SSA Running with backlight ON
Power Not Charging		0.012 W	0.96 W	1.28 W	1.73 W	1.72 W	2.21 W
Power Charging		N/A	2.25 W	2.53 W	3.05 W	3.00 W	3.50 W
Current Not Charging	15 V	0.9 mA	65 mA	85 mA	118 mA	116 mA	150 mA
	12 V	1.1 mA	80 mA	107 mA	144 mA	143 mA	184 mA
	9 V	1.3 mA	105 mA	137 mA	191 mA	189 mA	243 mA
Current Charging	15 V	N/A	65 mA	85 mA	118 mA	116 mA	150 mA
	12 V	N/A	80 mA	107 mA	144 mA	143 mA	184 mA
	9 V	N/A	105 mA	137 mA	191 mA	189 mA	243 mA

NOTE: Current (milliamperes) draw varies with voltage while the power consumed (watts) is constant.

Question #3

What is the minimum RT-60 that can be measured with the 824 RTA?

Answer

The graph on the next page shows the minimum RT-60 that can be measured. This is also called the "Residual RT-60" and is a function of the 1/3 octave filter response times.

Residual RT-60
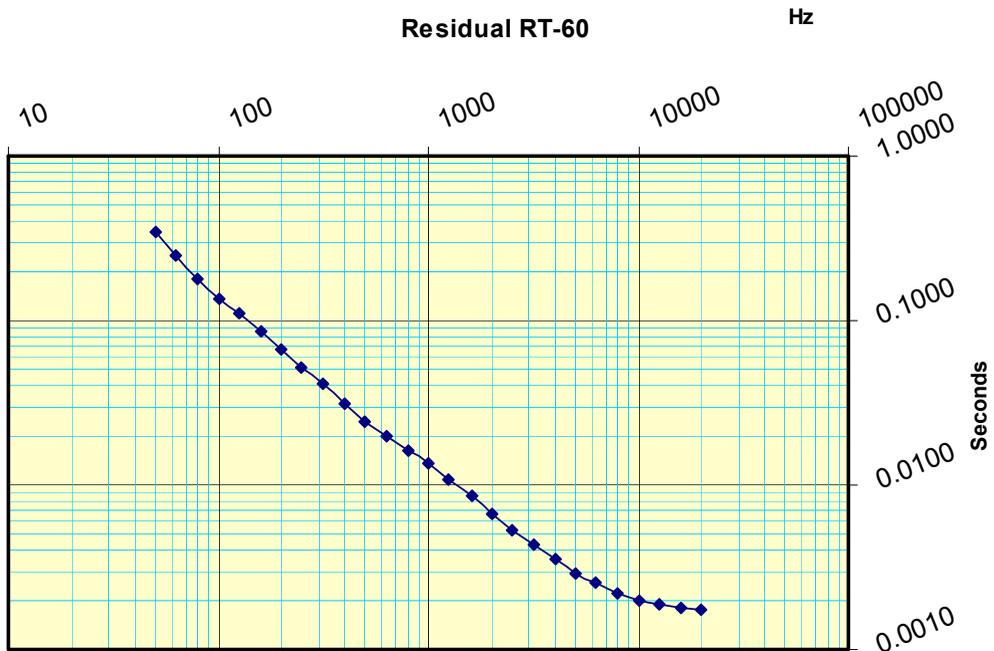
Question #4

What does **"Start Level"** do as found in the SSA and LOG instruments' "Ln" settings menu?

Answer

The "Start Level" setting indicates where the histogram table from which Ln data is calculated begins. The table only has a range of 128 dB yet the 824 can measure over a 150 dB range when the Gain or Range settings are considered. The default value for "Start Level" is 15 dB and provides Ln data and SPL histograms from 15 dB up to 142.9 dB.

"Start Level" is also used with the main weighted Leq in the Time History. Due to internal data encoding, the range is limited to 127 dB and uses "Start Level" to determine the desired measurement range. Since the time history is a data logging function and the likelihood of changing the Gain or Range setting is slim, this is sufficient range. The other

Advanced Time-History levels do not have such restrictions. Since you can select the main Leq to be A-weighted and also enable another A-weighted Leq (TWA indication in 824 Utility) the two levels will be identical except when the main Leq is limited by "Start Level". When set to 15 dB the lowest time-history Leq will be 16 dB due to the fact that the lowest value byte (0) is used as a delimiter in the data structure.

What is a good value to set "Start Level" to? 15 dB is a good value for most applications since it is just below the thermal noise rating of most condenser and pre-polarized microphones. If you need to measure lower and have a transducer with a lower noise floor, then reduce the value to just below or at the noise floor. If you are measuring levels that may be above 143 dB then you will want to raise "Start Level" to a higher value (a 1/4" microphone can measure upward of 160 dB so a "Start Level" of 35 dB will give a range of 35 dB up to 162.9 dB).

Question #5

How are Leq values calculated in the 824 and how is that different than traditional non-DSP (Digital Signal Processor) instruments.

Answer

First let's look at the tradition instrument and then the DSP instrument.

In mixed analog/digital instruments (such as the LD 870 or 820, or the B&K 2236 or 2238) Leq is calculated by sampling and integrating the output of a True-RMS detector circuit that has an exponential time constant (generating a voltage proportional to SPL with the Slow or Fast response) with an ADC (Analog to Digital Converter). That sample rate is many times per second to ensure accurate Leq readings. If an Leq time-history is taken in this type of instrument, and the storage rate is fast enough, you will see that the Leq will not decay any faster than the detector rate of the SPL it is sampling.

New DSP based sound level meters do not have the analog detector, but rather detect the SPL and Leq digitally by sampling at a rate that is double the highest desired frequency (Nyquist) and then processing the waveform. The System 824 uses a sample rate of 51,200 samples per

second. The Leq detector and the SPL detectors can be totally isolated without any additional circuitry (the cost to do this with analog circuitry would be very prohibitive). So what is an Leq? It is the energy average of a signal over a period of time. Now with separate digital detectors, the Leq does not have to exhibit the decay of the SPL exponential detector but can be true to its definition. That means that if an Leq time-history is taken in this type of instrument, you will not see any SPL decay effects.

Is this good or bad? It is different more than good or bad, but there are benefits from that difference.

Good: Many scientists feel that this is good because Leq time-histories show the true dynamics of the signal without the residual decay effects of an exponential detector. For example if you measure a sonic boom with a fast Leq time-history, it can show the two impulses of the 'N' wave and possibly even an echo or two. On the other hand, the older instruments will show one pulse that may take upward of 20 seconds to return to the background level.

Bad(?): If you are comparing data from traditional instruments it is important to be aware of this phenomenon, but it is not necessarily bad. If the Leq values being compared are of long duration (one minute or longer) then there is little blur caused by the exponential detectors of the older instruments and the data are very comparable.

Question #6

If I choose to save C-weighted SPLs every two seconds in the LD824's Time-History, what am I getting?

Answer

You get the instantaneous SPL at the end of the two-second period.

Question #7

How does this compare with C-weighted Leqs?

Answer

The Leq is the true equivalent level for that two-second period as if the signal level were constant amplitude.

Detailed Explanation:

So what's the difference between sampled SPL and an Leq for the same period? It depends on whether you are using

fast or slow SPL and the dynamics of the signal, of course, but the concept is still the same. It all goes back to your statistics classes and sampling theories. For an integration to be accurate, it must sample the data sufficiently fast enough so that the errors are minimized for a given data variability. Thus for fast, the amplitude variability is greater so the sample rate must be faster.

Inside the 824 we sample fast enough that the integration is always accurate and gives you the Leq data at the time period desired, i.e. all the energy received for that Leq period is contained within the Leq. The old instruments sampled the SPL detectors and integrated the sample number, so they had to sample them pretty quickly (32 samples per second for the LD 820 & 870).

You indicated that you are looking at a C weighted (the frequency weighting doesn't matter) SPL sampled every two seconds. The worst case error between the Leq and the SPL is with an Impulse whose onset is immediately after a sample has been taken. The decay for Slow is about 4dB per second and fast is 8 times faster at 32dB/s. In two seconds the next sample will read 8dB below that maximum for Slow and 64dB below the maximum for Fast. Mind you that this is worst case. You can plug that sawtooth waveform into a calculator and do an integration to get the Leq, but you see that there can be a great difference potentially. For example if the impulse had a max of 108dB and the sample two seconds after the max was 100dB the Leq would be 105.6 dB; the SPL would be 5.6dB lower than the Leq would be for that worst case signal.

In the real world we do not get that type of signal too often. Lightning might be the closest thing to it. Statistically the confidence can be determined. The timing of these pulses will not fall so precisely with the sampling and there are not such narrow impulses that can form this sawtooth waveform, so we do not see that much error in reality.

Question #8

What is the difference between the Max and Peak level that can be stored in the LD824's Time-History? What is the relationship of SPL, Leq, Max and Peak?

Answer

SPL is the instantaneous Slow, Fast or Impulse sound pressure level as defined by in the ANSI S1.4 and IEC 651 standards. They are true-RMS (root-mean-squared) levels. The "detector time constant" for Slow is one second and for Fast it is one-eighth of a second. The "detector time constant" for the Impulse detector is 35ms with a fixed decay time of about 3dB per second.

The Leq is the energy average of the waveform encountered during the duration of the time-history period.

The Max level is the maximum SPL obtained for the selected detector during the duration of the time-history period.

The Peak is the instantaneous maximum amplitude of the incoming waveform encountered during the duration of the time-history period. The peak of a continuous sine wave is 3dB higher than its RMS or SPL value.

Question #9

Is it possible to control the 824 'Run' and 'Stop' from an external signal (example 0 to 5 volt)?

Answer

Yes. The Logic Input line on the control connector at the base of the 824 can be set to control the Run/Stop of the instrument. This input takes a zero to five volt digital signal and performs the function selected by the Logic-In setting found in the Controls menu (SETUP > Edit Settings > Controls > Logic-In).

When set to Toggle it works just like the Run/Stop key. You can connect a momentary push-button switch from the five volt wind direction power (pin 6) to the logic input control line (pin 3).

When set to Level it forces the unit to be in run mode when the logic input is high (+5 Volts) and forces a stop when it is low (0 Volts). You can connect a toggle switch from the wind direction power (pin 6) to the Logic Input (pin 3) the 824 will run when the switch is ON and be stopped when the switch is off. Note: The Level setting will override the Run/

Stop key on the instrument and the M3 & M4 I/O commands!!!

The 9-PIN Miniature DIN connector needed can be purchased at www.digikey.com as P/N CP-2090-ND.

Question #10

What is the key sequence to perform a User Reset?

Answer

By holding down the RESET, the CHECK and the POWER keys simultaneously to turn the 824 on will activate a User Reset. This User Reset will perform a complete memory test, reset all data, erase all user setup IDs (Instrument Definition or setup file) and recall from EEPROM one SSA, one LOG and one ISM setup ID. These three setup ID are created from the Tools > Memory > Create EEPROM Backup menu item. You may want to perform a User Reset if the settings stored in the memory of the 824 have become corrupted. A User Reset is performed whenever the firmware is upgraded. It advisable to make archive copies of all setup IDs using 824 Utility software regularly.