

AP-QA401

HI All

By combining two or more instruments you can get more data that can help resolve a plaguing problem or come up with a new solution.

I writing this in a non-detailed mode as I hope my readers should have some prior experience using the AP and the QA401 or other similar products.

I'm writing this application note so it can give you some useful information to help solve some problems and give useful test information to many users. Several of the things I'm putting in this note are to help you think outside the box. I'm not specifying that the QA400/QA401 is the only instrument that could be added to the output of the AP other analyzer to get an FFT display. Demain Martin has loaned me his QA401 for testing. I have enjoyed working with it and it is a great tool.

I have had several clients that have a needed to improve their use of the AP System One. Several want to add DSP to the system this can be done however it means that a scrapped 222 or 322 are needed to do this or just buy another AP. I have recommended that they buy a secondary device to work with the AP System. The AP is a **GREAT FRONT END**, it is all analog, full auto ranging and the bandwidth is > 500 kHz. By adding a QA400/QA401 to the monitor output (1 volt level) you can get a FFT display making the 22/22A a DSP measurement system.

QA400 / QA401:

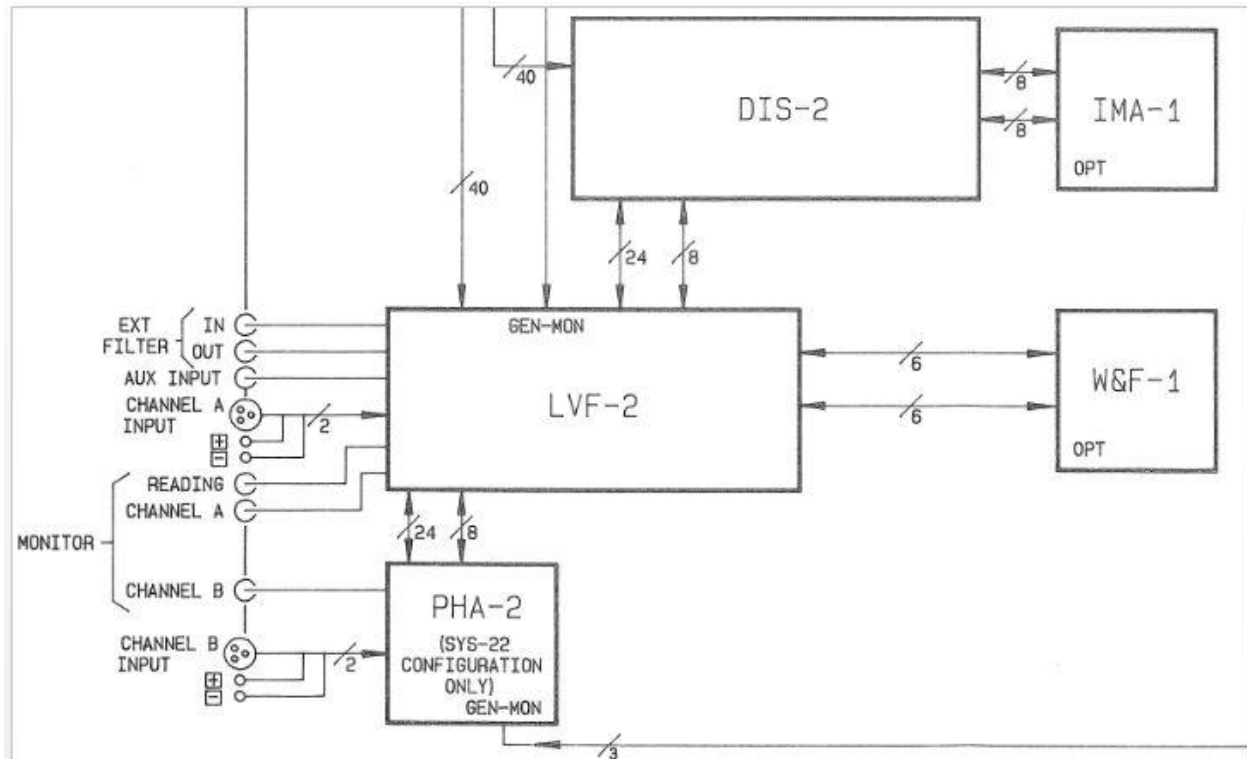
The inputs to the QA400/401 have some DC and AC voltage limits that if exceed can burn up the input stages. By using a new box as an input buffer you can't overload the input stage. The AP outputs are AC coupled and typically 1 volt in level.

BASIC System One Inputs:

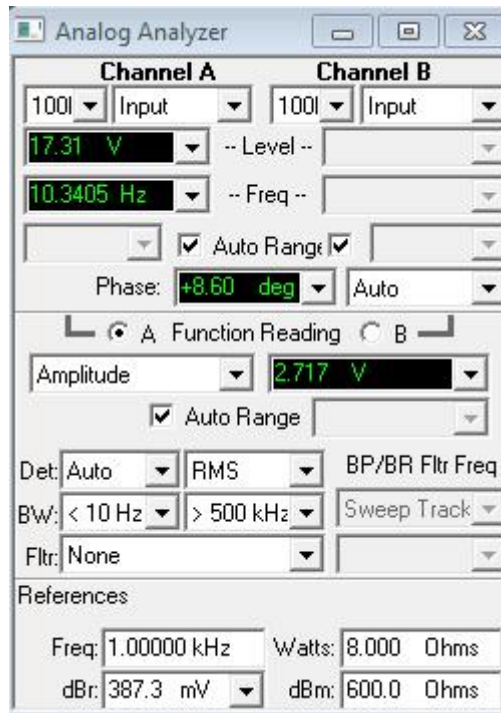
The XLR / DUAL BANANAS inputs are DC Coupled and can have **termination resistor(s)** of 100k (AC), 600 or 150 Ohms (DC). The inputs to the ANALYZER are AC coupled through matched 1.0uf capacitors and the input voltage is limited to 200 Vpk.

The Channel A and Channel B inputs send the signal to the Channel A and Channel B on the MONITOR OUTPUTS PANEL all of the time. This level is about 1 volt.

The **Auto Range** on the **Analog Analyzer** should be checked. The system has two meters. One of the meters is for the selected channel to monitor the input of channel A or B without filtering and the other meter is for the READING MEASUREMENTS. The Reading Meter can have several filtering options and its output is sent to the “READING OUTPUT BNC” on the MONITOR OUTPUTS PANEL.



Audio Precision System One Analog Analyzer Block Diagram

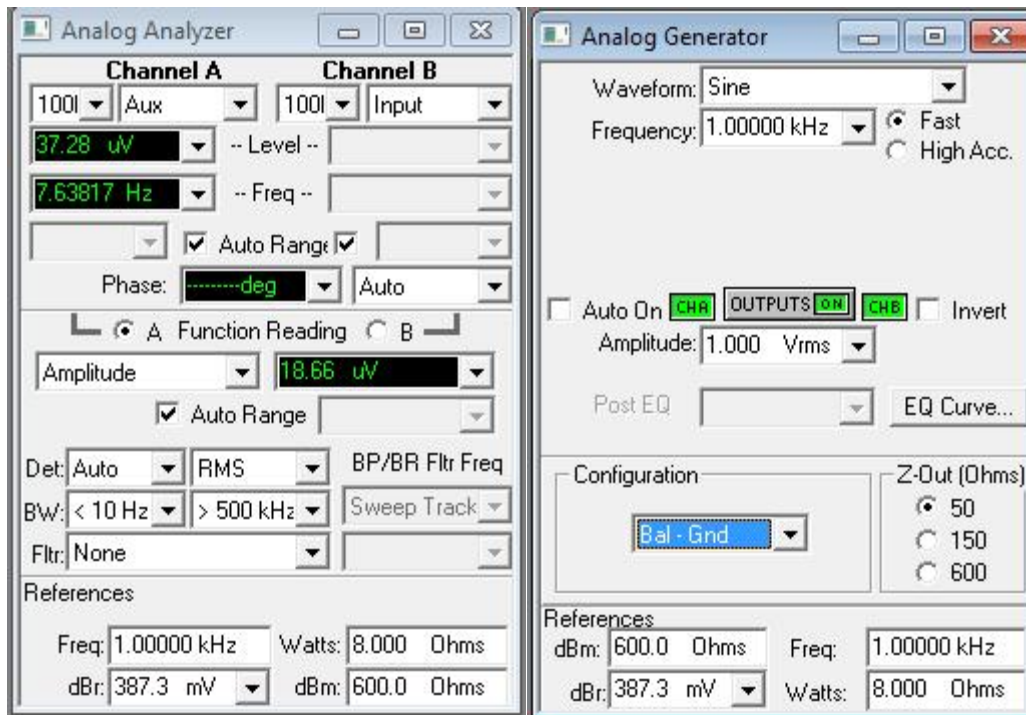


Audio Precision System One Analog Analyzer Panel

System One AUX input:

The AUX input is also AC Coupled and has no termination resistor like the XLR's have. If you use a **Scope Probe** the attenuation will almost double as the basic input is 100k ohms (AC no terminating resistor). 10:1 probe / 20dB will be about 40dB as the scope inputs are typically 1meg. The other thing about the scope probe is that the frequency response will not be FLAT. Measure and calibrate it by connecting it to the generator and have the **Analog Generator** output set to **Bal-Gnd** mode.

Note: Other probe can be used, however watch the voltage & power ratings of the probe or attenuator used.



Audio Precision System One Analog & Generator Panels

BASIC System One Outputs:

The **Channel A** and **Channel B** monitor outputs are full bandwidth >500 KHz as they have no filter. The **READINGS** output has functions that select specific type of filtering. You can keep **Function Reading** in **Amplitude** mode and select different BW modes to suit your specific test requirements.

Distortion THD:

By keeping the **Function Reading** in **THD** mode the **READINGS** output signal can be sent to a scope and or a small speaker system so you can hear the tonal quality of the signal with the fundamental signal removed. The small speaker system needs to have a volume control. Sometimes I even use a headphone for critical noises.

The AP may give a single number or a graph for THD% where adding FFT the debugging gives you a lot more detail of the data or problem.

Connecting the QA401 input(s) unbalanced mode to the AP **Channel A** or **Channel B** or Both **MONITOR OUTPUTS** will allow you to use the AP for an Auto Level Signal and keep about a 1 volt AC only input to the QA401. By setting up the AP in Auto Range it will keep the signal in the sweet spot.

Note: Sometimes you may want to set the specific input range to stop the Auto Range from an annoying dancing signal.

I connect the READING/ERROR output signal to a small amplifier speaker system so I can listen to the ERROR signal. If it sounds BAD this is typical odd harmonics. If it sounds SMOOTH this is typical even harmonics. If it sounds HUMMY this is typical bad grounding. Sometimes it is just all BAD. This is then a clue about the problem and time to DEBUG IT.

The AP's READING/ERROR output signal this can be used as a tool to help lead you as to what real distortion products are as the fundamental signal is notched out.

Distortion IMD:

The AP may give a single number for IMD% where adding FFT the debugging gives you a lot more detail of the data or problem.

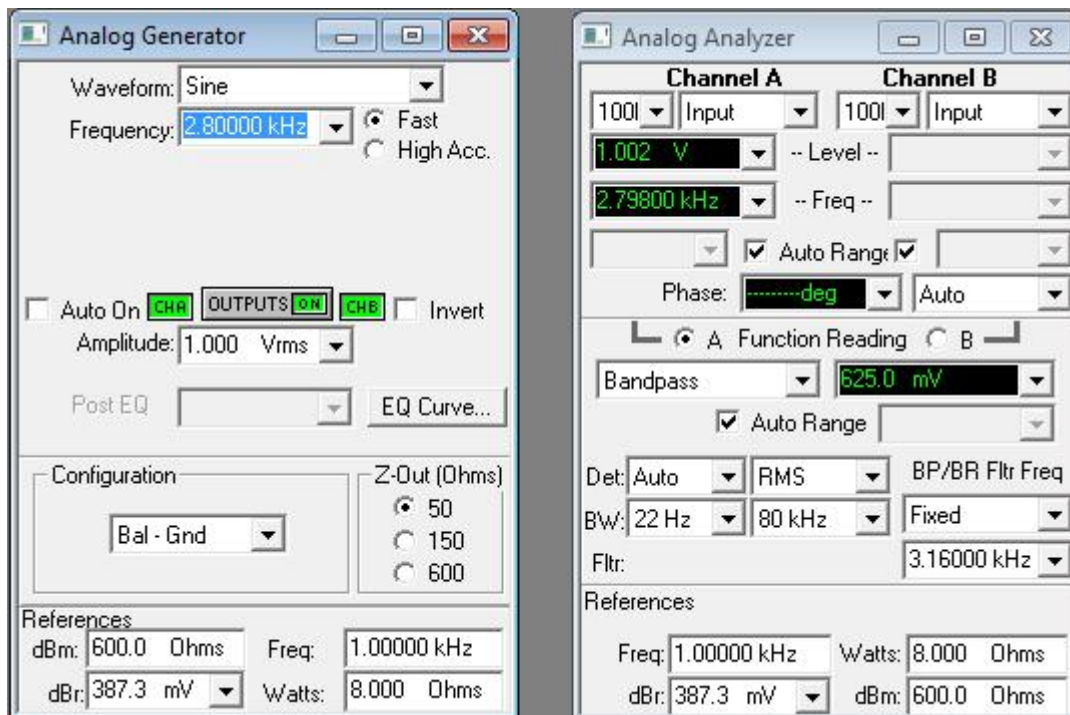
Wow & Flutter:

The AP gives a single number for WF% where adding FFT the debugging of a tape recorder you can see the real problem or problems of the rolling system.

I have had some clients that I have had them buy an external Wow & Flutter meter and take the output and send it to an FFT for greater debugging.

AP TUNABLE FILTERS:

The AP has tunable filter(s) that can be programmed and give more detail. By setting a **FIXED FREQUENCY** in the **BANDPASS** or **BANDREJECT** mode the basic range of measurements can be improved.



Audio Precision System One Bandpass settings Panels

Debug Power Supply:

The AP gives a single number for noise (Analog mode) where adding FFT the debugging gives you a lot more detail of the problem. The spectrum is still limited to 20 kHz and this is more than usually needed for non-switching power supply. Some switching power supplies do have HUM and or noise products that fall below 20 kHz. Many switching PS have free running PFC and other switcher that can beat down into the 20 kHz spectrum.

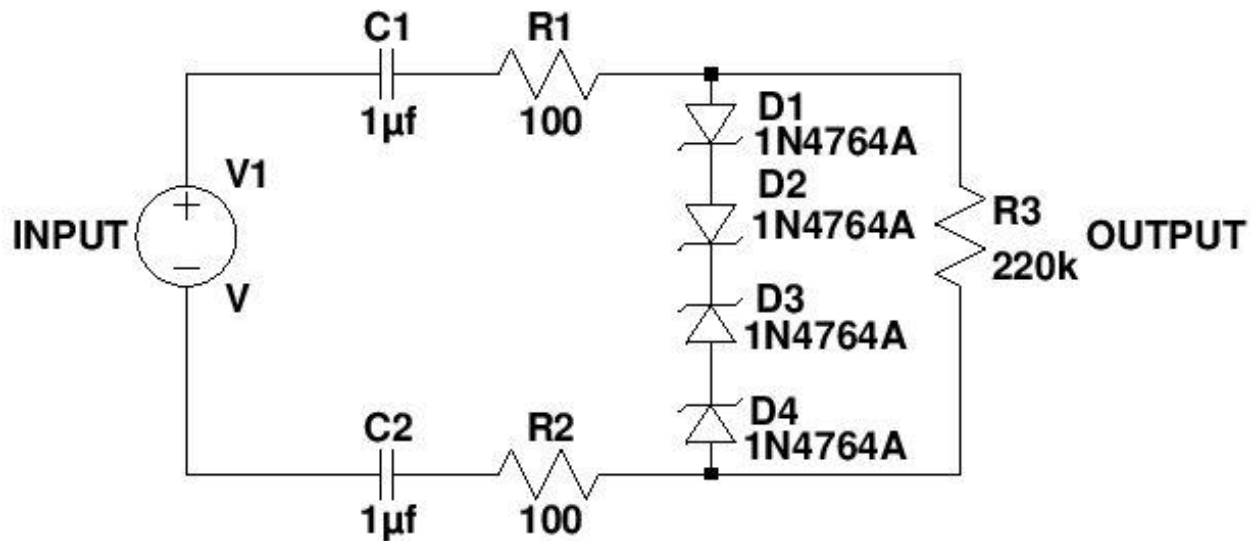
Trouble shooting High Voltages, with the slip of the probe:

The AP input is limited to 200 Volts and above this damage can happen. I have used several work arounds for this problem. I used both my TEK 465B, TEK 2465B & TEK 2430 as the front end taking the rear output signal and connecting it to the AP. Note: Many other scopes have a channel monitor output. The signal is in the 1 volt range and the distortion / linearly is only about 70-80dB range it is typical better than

many tube type products. Run a test to calibrate/set the best measurement limit using this setup.

When debugging high voltage products directly into the AP I recommend that an adapter box be used in front of the AP input. I used a small plastic box with dual bananas female inputs and dual bananas male outputs with 1uf 600/800v caps, 100 ohms series and back to back 200 volt Zener's and 100k-220k across the Zener's.

Note: C1 & C2 are not matched and this will make the CMRR poor however the AP front end will survive.



Making the measurement system work:

I first used two computers to run the tests, one to run the AP and another to run the QA401. All worked well, no problems.

I now tried a single Win 7 laptop to run the AP using APIB-USB and the QA401. This works well and no problems controlling both systems. The AP is only set for the monitor mode and its panel in the background.

I have not used a single computer running an AP CARD and the QA401. The systems and computers / OS's I have are not configured to do this, however it should work.

When using the AP as a front end and using outputs other than the **Channel A** or **Channel B MONITOR OUTPUTS** you may have some other errors that may popup during the use of the **READING OUTPUT**.

Using the AP with QA401 in making Tests:

The QA401 cycles with output signal and this has some impact with a few tests that I'm running. The signal is not continuous, it cycles on & off.

When connecting the AP's **Channel A** or **Channel B MONITOR OUTPUTS** to the QA401, make sure to add the shorting BNC caps to the Negative inputs.

Using the AP with SOUND CARDS:

The AP can also be used as the front end for sound cards as the **Channel A** or **Channel B MONITOR OUTPUTS** or **READING OUTPUT** is typically 1 volt levels.

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LinkedIn, Classic AP Audio Systems Group LA

LinkedIn, Classic AP Audio Systems Group (Old group that can't be updated)

Misc. notes:

Demain has used the AP System One as the front end with his Pico Scope.

Power of the APIB USB: = 50ma.

Power of the QA401: idle = 340ma. Program running, no capture = 540ma/5.01Vdc

I used the QA401 with other AP's System Two and System Two Cascade. They all work the same; however I did not use any DSP function during the testing.