Using the HammondAnalyzer 2.1 (prelimiary)

Installation

System requirements: PC with Windows 98 up to Windows XP; Vista and Windows 7 not tested, 64 Bit not supported. Hardware requirements are quite low, any PC running at 500 MHz and 256 Mbyte RAM should work.

Insert Installation CD-ROM and start "Setup.exe". Follow installation guide. HammondAnalyzer will be installed in subdirectory "HammondAnalyzer" in "Program files". Copy measurement directory "Organs" to a convenient local folder/volume.

Check default sound input on Windows "Sound" control panel. If available, select **volume boost** for microphone input. Deselect all other sound inputs, also deselect sound enhancements like bass boost, room effects, auto-level, equalizer etc. as these will distort measurements. You may select sound output on microphone input (route- through) to hear probe input signal on internal speakers; recommended for notebook use.

After installation, start HammondAnalyzer by Windows Start/Programs menu. The main window will appear. If error messages pop up, select "OK" or "Continue".

Click green button "Open" and select file "TG-new1.xls" (empty file). Click red button "Open Ref" and select file "TG-CalGen.xls" (both in "Organs" directory). Click folder icon "Browser" and select yout preferred Web Browser (e.g. firefox.exe, explorer.exe) in "Program Files" directory on your C: drive. Files selected here (as other defaults as well) will be re-opened on next program start.

Next, set "Audio Card Defaults" by selecting your sound device. In most cases, onboard sound input is "Device 0". Device Status indicator should light up green; if red, sound device is not ready or not present. Set "Wave Offset" to 500 (samples); some audio drivers do not start recording correctly, so a slight offset helps. Well-written drivers do not need any offset (set to 0). Set "HW scaling" to "2" (by clicking into field and entering the number, fine adjust by up/down arrows).

Connect probe adaptor box to USB (only used for power supply) and the **microphone input** jack (pink). Set switch on box to "CAL". The box now generates a set of calibration tones ("C" notes on all octaves plus a chromatic scale), level 5 mV, duration about 1 second with short pause in between.

If microphone driver works correctly and "HW scaling" is appropriate, a waveform should appear in the small oscilloscope window when the calibration tone is present. Adjust "HW scaling" to a value so "mV RMS" meter shows a reading of 5 mV (midscale). With microphone boost selected in the sound driver, a "HW scaling" value of about 0.5 should be OK. The auto-scaled oscilloscope waveform should show undistorted sine with no clipping.

You will notice the cursor in the main window follow the played notes and record the levels as green bars. Now all end points should have the same level, only the highest and lowest notes may sag a little (less than 0.5 mV). If they match the red "TG-CalGen.xls" points,

calibration is complete. Exit the program by clicking "QUIT" (saves calibration and defaults) and restart the HammondAnalyzer. Click “Erase Meas.” to clear graph.

Picture: After calibration with the adaptor box, green record should show this graph (disregard red reference).

Using the HammondAnalyzer

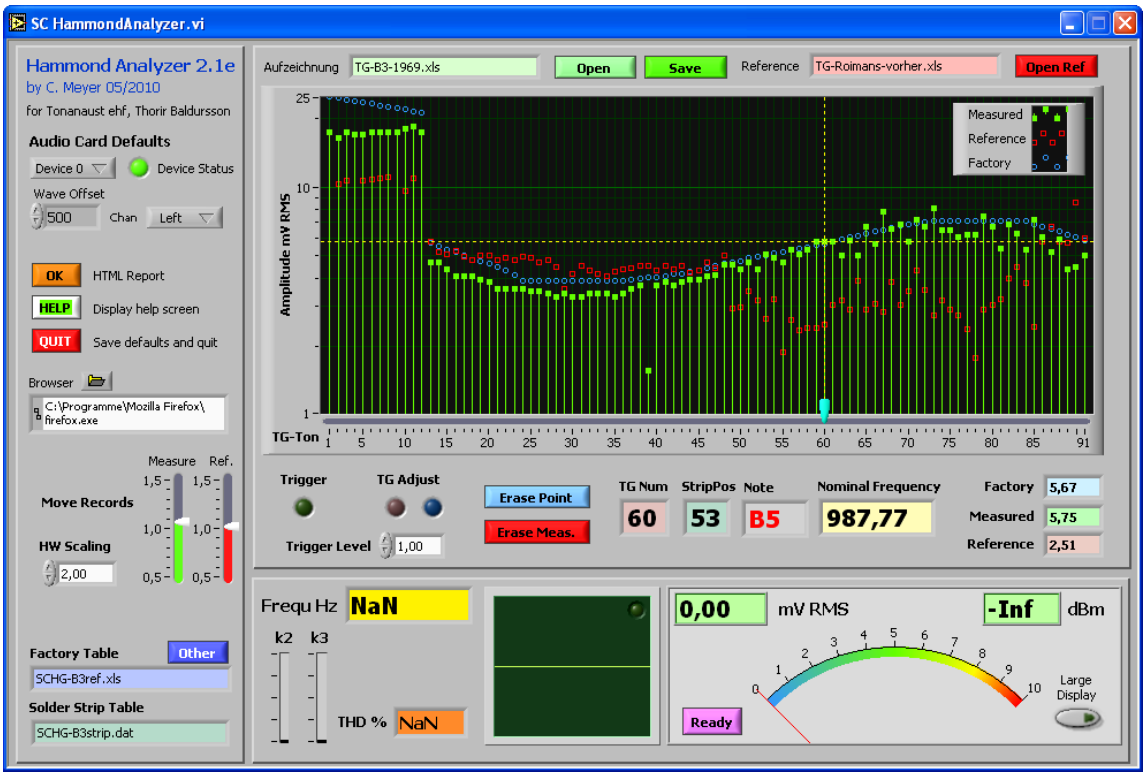
Now start your Hammond! Set adaptor box switch to "MEAS" and connect black probe cable to generator ground (rightmost solder lugs on solder strip). Now touch every generator note output on solder strip with red probe clip for about a second. Within a half second, HammondAnalyzer detects level and frequency of the note and records it in the main graph. Repeat for all notes 1 to 91, beginning at leftmost solder strip joint; this only takes about 2 minutes. When finished, you should save your recording by clicking the green "Save" button, giving it a unique name (like myorgan_before.xls). To erase a single point record, click "Erase Point". To erase the whole measurement, click "Erase Meas."

Remark: Bass notes 1 to 13 carry a higher RMS voltage in the 20 mV range, so clipping may occur, depending on your microphone input headroom. This is not critical, anyway the recorded levels of note 1 to 13 may not be correct. You may try deselecting the microphone boost and use a different "HW Scaling" (recalibration necessary, see above).

You may load a Reference plot (red) at any time, for example to compare your organ against a previous recording, also from a different organ. Ideally, your organ's record should match the blue "Factory calibration" graph. A deviation of 1 mV per note is totally acceptable, but older or deadjusted generators show a huge "sag" on notes 49 and above - these were the ones with bad capacitors (see some example references in "Organs" directory, mostly named "XXX_vorher.xls").

Generator Calibration

To determine a bad note, shift the cyan-colored slide to that note with your mouse. The numeric fields will show the corresponding TG note number and solder strip position, counting from leftmost solder lug (1) up. If a note is very weak (below 1 mV), the trigger logic may be tweaked by lowering the "Trigger Level" to a value below 1 mV, otherwise the note detection circuit will not trigger.



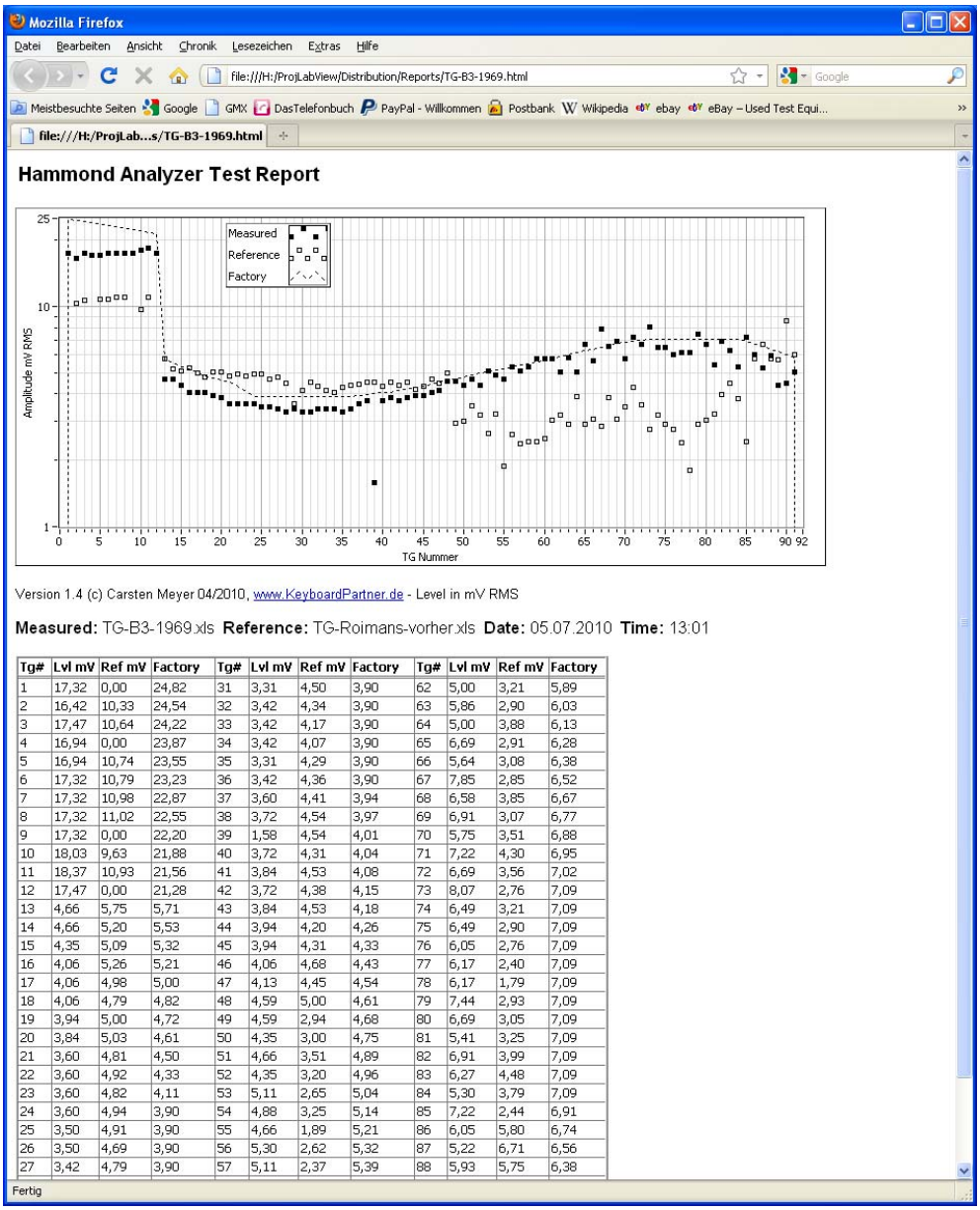
Picture: Example recording “TG-B3-1969.xls” (green) with bad (weak) TG note 39, otherwise OK. Reference (red) is an old B3 organ with bad capacitors (sounds dull).

Connect the probe permanently to the weak (or too strong) note. After 2 seconds, the HammondAnalyzer will switch to **adjustment mode**, where the note level bar (green) is updated every 200 ms (blue "TG ADjust" indicator will light up when updating). You may now calibrate this note by loosening and adjusting the magnetic rod of this note (refer to organ's service manual to locate the rod, using the displayed "TG Num"). Use a 4 mm wrench to loosen the screw. On higher notes, shifting the rod a few tenth of a mm are critical, so be careful! Sometimes the rods are rusted or seized (soak whith WD-40 for a day), so little force may be needed to move it. For a large meter display while note calibration, you may check the "Large Display" button. If finished with a note, click the magenta "Ready" button. This will stop the adjustment mode on that particular note. Disconnect probe and continue with the next bad note.

Other features

If a recording or reference was recorded with inappropriate "HW Scaling" (sometimes older records by other customers), the complete record graph may be shifted up or down with the "Move Records" sliders. Set these to 1.0 normally. On most organs, TG notes 21 to 35 should show a level of around 4 mV, so use these as a lead.

Bars k2 and k3 (harmonics) and field THD show the sine distortion of the measured note. On lower notes, these may be in the 5% range; this also makes the "Hammond sound". On higher notes, especially those with capacitor filters, distortion falls below 1%.



Tg#	Lvl mV	Ref mV	Factory	Tg#	Lvl mV	Ref mV	Factory	Tg#	Lvl mV	Ref mV	Factory
1	17,32	0,00	24,82	31	3,31	4,50	3,90	62	5,00	3,21	5,89
2	16,42	10,33	24,54	32	3,42	4,34	3,90	63	5,86	2,90	6,03
3	17,47	10,64	24,22	33	3,42	4,17	3,90	64	5,00	3,88	6,13
4	16,94	0,00	23,87	34	3,42	4,07	3,90	65	6,69	2,91	6,28
5	16,94	10,74	23,55	35	3,31	4,29	3,90	66	5,64	3,08	6,38
6	17,32	10,79	23,23	36	3,42	4,36	3,90	67	7,85	2,85	6,52
7	17,32	10,98	22,87	37	3,60	4,41	3,94	68	6,58	3,85	6,67
8	17,32	11,02	22,55	38	3,72	4,54	3,97	69	6,91	3,07	6,77
9	17,32	0,00	22,20	39	1,58	4,54	4,01	70	5,75	3,51	6,88
10	18,03	9,63	21,88	40	3,72	4,31	4,04	71	7,22	4,30	6,95
11	18,37	10,93	21,56	41	3,84	4,53	4,08	72	6,69	3,56	7,02
12	17,47	0,00	21,28	42	3,72	4,38	4,15	73	8,07	2,76	7,09
13	4,66	5,75	5,71	43	3,84	4,53	4,18	74	6,49	3,21	7,09
14	4,66	5,20	5,53	44	3,94	4,20	4,26	75	6,49	2,90	7,09
15	4,35	5,09	5,32	45	3,94	4,31	4,33	76	6,05	2,76	7,09
16	4,06	5,26	5,21	46	4,06	4,68	4,43	77	6,17	2,40	7,09
17	4,06	4,98	5,00	47	4,13	4,45	4,54	78	6,17	1,79	7,09
18	4,06	4,79	4,82	48	4,59	5,00	4,61	79	7,44	2,93	7,09
19	3,94	5,00	4,72	49	4,59	2,94	4,68	80	6,69	3,05	7,09
20	3,84	5,03	4,61	50	4,35	3,00	4,75	81	5,41	3,25	7,09
21	3,60	4,81	4,50	51	4,66	3,51	4,89	82	6,91	3,99	7,09
22	3,60	4,92	4,33	52	4,35	3,20	4,96	83	6,27	4,48	7,09
23	3,60	4,82	4,11	53	5,11	2,65	5,04	84	5,30	3,79	7,09
24	3,60	4,94	3,90	54	4,88	3,25	5,14	85	7,22	2,44	6,91
25	3,50	4,91	3,90	55	4,66	1,89	5,21	86	6,05	5,80	6,74
26	3,50	4,69	3,90	56	5,30	2,62	5,32	87	5,22	6,71	6,56
27	3,42	4,79	3,90	57	5,11	2,37	5,39	88	5,93	5,75	6,38

Picture: HTML report may be printed with web browser.

For a printout or HTML report of your current recording, click the orange HTML report button. This will save the graph and value table as pictures embedded in a HTML page (in folder "Reports") and open the selected web browser with that page. You may also use the ".XLS" files for further processing; these are pure text format and may be opened with any text editor. The ".XLS" extension was choosen for convenience, they also open up in Microsoft Excel directly.

Carsten Meyer (info@keyboardpartner.de)