ALMA Spring Symposium
“Test and Measurement Systems”

THE CLIO SYSTEM
AUDIOMATICA S.r.l., ITALY

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THE HR-2000 PC BOARD

THE CLIO SYSTEM

REL.4.5 SOFTWARE
CLIO FEATURES IN GENERAL

- PC-IBM BASED INSTRUMENT
- PROPRIETARY HARDWARE DESIGN
- TWO CHANNELS INPUT
- TWO CHANNELS OUTPUT
- FREQUENCY COVERAGE: <1 Hz - 22 kHz
- 16-BIT RESOLUTION
CLIO - WHERE?

R&D LAB

QUALITY CONTROL

PRODUCTION LINES
HOW DOES HARDWARE DESIGN REFLECT ON YOUR INSTRUMENT?

- GENERAL PERFORMANCE AND ACCURACY
- EASE OF INTERFACING
- OPERATION LIKE ITS ANALOG COUNTERPART
- FULLY PROGRAMMABLE GENERATOR
- THE ANALYZER AND GENERATOR OPERATE SEPARATELY (GENERATOR IN BACKGROUND)
• PRECISE OUTPUT SIGNAL CONTROL
  • FROM +12 dBu TO FULL MUTE IN 0.1 dB STEPS (SINE)

• HIGH INPUT ACCEPTANCE:
  • FROM +30 dBV TO -40 dBV FULL SCALE

• SINGLE-ENDED OR BALANCED ACQUISITION

• VARIABLE SAMPLING: 51.2 KHz TO 1.6 KHz

• DUAL DMA TRANSFER TO PC (OR I/O)

• ON-BOARD MICROPHONE POWERING
HOW DOES SOFTWARE DESIGN REFLECT ON YOUR INSTRUMENT?

• IT’S EASY TO LEARN

• IT’S EASY TO USE IN EVERYDAY WORK

• GIVES YOU THE IMPRESSION OF FACING AND OPERATING A REAL INSTRUMENT

• GIVES YOU INTEROPERABILITY BETWEEN DIFFERENT MEASUREMENTS
CLIO FEATURES - SOFTWARE

• WINDOWS-LIKE USER INTERFACE
• CUSTOM CONTROL PANELS
• CONTEXT SENSITIVE HELP ON-LINE
• POWERFUL EDITING AND EXPORT
• ON-THE-FLY HW SETTINGS CONTROL
• CONTROLS FOR EXTERNAL HARDWARE
CLIO MEASUREMENT TECHNIQUES

• MAXIMUM LENGTH SEQUENCES (MLS)
• SINUSOIDAL ANALYSIS
• FFT ANALYSIS
• ONE-THIRD OCTAVE ANALYSIS (RTA)
• ACOUSTICAL ANALYSIS (RT60, Leq)
• LEVEL, L-C METER AND OSCILLOSCOPE
MAXIMUM LENGTH SEQUENCES (MLS)

- FREQUENCY AND PHASE RESPONSE
- IMPULSE RESPONSE
- ANECHOIC ANALYSIS
- ENERGY TIME CURVE (ETC)
- WATERFALL PLOTS
MLS ANALYSIS TECHNIQUE

MLS SIGNAL -> D.U.T. -> DUT RESPONSE -> CROSS-CORRELATION

MLS ANALYSIS TECHNIQUE

TRANSFER FUNCTION

FFT

IMPULSE RESPONSE
SINUSOIDAL ANALYSIS

- FREQUENCY AND PHASE RESPONSE
- OPTIONAL GATED ACQUISITION
- HARMONIC ANALYSIS VS. FREQUENCY
- DISTORTION VS. LEVEL (THD, SMPTE, CCIF, DIN)
- IMPEDANCE & THIELE-SMALL PARAMETERS
- POLAR RESPONSE PLOTS
SINUSOIDAL ANALYSIS TECHNIQUE

D.U.T.

SYNCHRO & GATING

HARMONIC SELECTION

DIGITAL FILTER

YES

NO
FFT ANALYSIS

• DUAL CHANNEL ANALYSIS AND DISPLAY
• TRANSFER FUNCTION
• INTERNAL TRIGGER
• REAL-TIME THD CALCULATOR
• ALLTONE AND MULTITONE GENERATION
CLIO AND QUALITY CONTROL
CLIO AND QUALITY CONTROL

• “ON-FIELD” DEVELOPED QC SOLUTION
• SIMPLE “GO-NO GO” MASKS
• ASCII FILE DRIVEN QC PROCESSOR
• SWEEPS, LEVEL, FFT, MLS, IMPEDANCE AND POLARITY TESTS
• INTERACTION WITH EXTERNAL HARDWARE TO REALIZE A FULLY AUTOMATIC SYSTEM
• LEVEL WITH BARGRAPH
  - UP TO 40 POSSIBLE
  - DEFINABLE STIMULUS
  - USER INTERACTION FOR DUT TUNING
  - TYP. EXECUTION TIME: 0.5s

• FFT
  - UP TO 14 POSSIBLE
  - DEFINABLE STIMULUS
  - RESPONSE, NOISE, THD, IMD & RUB+BUZZ
  - TYP. EXECUTION TIME: 1s

• MLS
  - UP TO 10 POSSIBLE
  - MAXIMUM LENGTH SEQUENCE PROCESSING
  - FREQUENCY RESPONSE & POLARITY CHECK
  - DUT SENSITIVITY CHECK
  - STANDARD DEVIATION WITHIN THE BATCH
  - TYP. EXECUTION TIME: 2s

• IMPEDANCE
  - UP TO 4 POSSIBLE
  - SINUSOIDAL STIMULUS
  - DEFINABLE TEST FREQUENCIES
  - T/S PARAMETERS CHECK
  - TYP. EXECUTION TIME: 0.1s/point

• SWEEP
  - UP TO 4 POSSIBLE
  - FOR CLASSICAL EAR-DRIVEN TESTS
  - DETECTION OF MECHANICAL NOISES
LOAD SETUP FILE

WAIT FOR USER OR TRIGGER TO START QC TEST

UPDATE DISPLAY AND STATISTICS

PERFORM OPTIONAL SWEEP

PERFORM NTH MEASUREMENT

MEASUREMENTS ENDED?

ALL RESULTS GOOD?

YES

TEST GOOD

TEST BAD

YES

NO

NO

YES

YES

NO

YES

NO

YES
START

OPTIONAL USER PROMPT

LOAD REFERENCE & QC MASK

EXECUTE MEASUREMENT

OPTIONAL AUTOSAVE

DISPLAY BAD MEASURE & PROMPT

EXECUTE SIGNAL ON BAD

BAD

CHECK RESULT

GOOD

EXECUTE SIGNAL ON GOOD

READY FOR NEXT

UPDATE STATISTICS

START
INTERACTION WITH EXTERNAL HARDWARE

[Signal on Bad]
LPTBit=3
STATUS=1
DELAY=200
[Signal on Good]
LPTBit=3
STATUS=0
DELAY=200
[Global on Good]
LPTBit=1
STATUS=1
RESPONSE AND SENSITIVITY WITH MLS

[MLS]
MLSOUt = -6
MLSin = -20
MLSREFCURVE = art300.mls
MLSREFLIMITS = sample.lim

[GLOBAL LEVEL]
MLSUPPER = +3
MLSLOWER = -3

[DATA]
FREQ (HZ) UPLIM (dB) LOWLIM (dB)
100 +5 -5
500 +3 -3
5000 +1 -1
7000 +5 -5

FREQUENCY RESPONSE BAD
FREQUENCY RESPONSE GOOD BUT LOW SENSITIVITY
QC LEVEL TEST WITH LOOP MODE

[LEV]
LEVOUT= -10
LEVSINUS= 1000
LEVACQUIDELAY= 0
LEVAVERAGE= IMP
LEVSINUS= 2000
LEVUPPER= -12.1
LEVLOWER= -13
LEVLOOPMODE= 1

POSSIBILITY OF D.U.T. TUNING
RUB&BUZZ FFT TEST
RUB&BUZZ QC FFT TEST

[FFT]
FFTACQUIDELAY=100
FTOUT=0
FFTNIN=10
FTREFCURVE=norub2im.fft
FTREFLIMITS=ftlim.lim
SINUS1=900
PERCENT1=50
SINUS2=1100
PERCENT2=50
HI-SPL QC FFT TEST

20 VRMS 1kHz BURST
50 W PEAK

TIME ALIGNMENT

[SINUS=1000
TON=30
TOFF=600]
IMPEDANCE QC TEST

[IMPEDANCE]
IMPREFCURVE=ref.imp
IMPREFLIMITS=impabs.lim
T/S PARAMETERS QC TEST

[PARAMETERS]
IMPREDC = 5.2
IMPQUPPER = 0.3
IMPQLOWER = 0.15
IMPFSUPPER = 70
IMPFSLOWER = 58
CLIOQC AMPLIFIER & SWITCHBOX

- 10 W POWER AMPLIFIER WITH CURRENT SENSING
- TWO OR EIGHT LINE / MICROPHONE INPUTS
- INTERNAL SWITCHES FOR IMPEDANCE OR RESPONSE MODES
- ALL FUNCTIONS ARE PC CONTROLLED

Diagram:

- Input 1, Input 2, Input 8
- Speaker
- 10 dB
- 10 W Power Amplifier
- PC Control
- To CLIO
- From CLIO
- I Sense
The CLIO system has now reached more than 2000 satisfied clients. Among them, over 10% bought quality control systems to assist several production facilities worldwide. A list of selected end users is available.