

Minutes of March 17, 2004 TC-10 Meeting in Boulder, Colorado

Draft Standard for Terminology and Test Methods for Digital to Analog Converters

Attendance:

Steve Tilden	Texas Instruments
Tom Linnenbrink	Q-Dot
Bill Boyer	Sandia National Laboratories
Bob Graham	Sandia National Laboratories
Sol Max	LTX Corporation
David Bergman	NIST
Jerry Blair	Bechtel Nevada
Fang Xu	Teradyne
Pasquale Daponte	University of Salerno

1. Solomon Max was named Recording Secretary for the DAC subcommittee

The recording of the minutes starts at that point in the meeting. Before the selection of the recording secretary, Pasquale Daponte was named as editor of the DAC document. The committee expressed its appreciation for the significant amount of work that has been done by Pasquale and his fellow writers in Italy.

2. Approval of Project

An application has been generated for approval of the DAC project. The project will be called **P1658** upon approval later in March 2004. The application is being coordinated through:

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Some additional information is needed for the application concerning the industries affected by the standards. The following list was generated and posted on the white board in the room by Tom Linnenbrink:

Audio
Waveform Generators
ATE
Telecom
Consumer
Medical
Environmental
Military
Test and Measurement
Broadcasting
Avionics
Aerospace
Robotics
Automatic Control
Geophysical

3. e-mail list

It was proposed that an e-mail list be generated which would include only those who are involved with the DAC Subcommittee. This would simplify e-mailings to the subcommittee.

4. Miscellaneous items

It was noted that Tom Meyer might be interested in participating in the DAC Subcommittee.

A site will be created.

5. Table of Contents

It was proposed that a web site for the DAC Subcommittee be established soon, and that a copy of the Table of Contents of the proposed standard be included on the site within one month. The protected area will have the name "DAC". The password to the protected area is yet to be selected.

Steve Tilden noted that the IEEE will only allow two levels for the Table of Contents, so that there will need to be some modifications of Pasquale's draft document to allow the readers to learn more about the contents from a two (perhaps three) level Table of Contents.

6. Document Name

The name of the standard was changed to "Draft Standard for Terminology and Test Methods for Digital to Analog Converters". The document will deal with monolithic and hybrid converters, to the exclusion of Voltage Calibration Sources, and Arbitrary waveform Generators. There had been a request by Chuck Adams from IBM that the title include words identifying the specifics of the document. The committee decided that the title was wordy enough as it was, and should not include other information.

6. DAC, D to A Converter, D/A Converter, Digital-to-Analog Converters

The committee decided that the devices being tested by the standard would be called either a Digital-to-Analog Converter or a DAC, to the exclusion of the other terms.

7. Review of Pasquale Daponte Document

The committee spent some time reviewing the text that had been generated by Pasquale Daponte, and others. It was recommended that the structure be reorganized to agree with the preliminary Table of Contents that had been introduced at the subcommittee's previous meeting last November. A copy of the Table of Contents is included with the minutes. Pasquale will be co-chairman of the committee.

7. Standards for the Document

The document will be formatted for A size paper. The figures will be generated in WMF format. Gif and tif formats, although allowed by the IEEE, will be discouraged. PICT formats are the equivalent of WMF formats for the Mac. They can be converted fairly easily. The DAC symbol, as proposed by Pasquale, should be used in all figures.

After the document is complete, the figures and the text are sent to the IEEE as two separate files. The editing of the standard before it is sent to the IEEE will be done section-by-section, with figures and text merged.

8. Modifying Versions of the Document

The following strategy has been formulated for modifying existing versions of the document:

1. Modify the existing section of the diagram in MS Word. When modifying keep the "track changes" mode set to "highlight changes". Keep the "track changes" mode on as well as the "highlight changes on screen" and "highlight changes in document". Save the document with a higher revision level than

the current revision. For Example: If it was “Rev 12.0”, save it as “Rev 12.1”.

2. Accept the changes, and save the document as the new revision with an “A” suffix “Rev 12.1A” in our example).
3. Send both documents to the subcommittee editor.
4. The editor will merge the recommended changes into a new revision. He will include on the web site a modified version with the changes highlighted (Rev 13.0 in our example). He will also include a version with the changes accepted (Rev 13.0A in our example).

This process should permit several people to modify the same sections without excess confusion.

8. Assignments:

Bob Graham: Generate a “format sheet” which will describe the margins, the fonts, the paragraph formats for headings, the numbering sequence of sections, and other useful information that will allow the document to be consistent and reproducible.

Solomon Max: Write a draft for the following Test Method sections:

- 2.4.1 Least Significant Bit (LSB)
- 2.4.2 Monotonicity
- 2.4.3 Static Offset
- 2.4.4 Static Gain Error
- 2.4.5 Differential Non-Linearity (DNL)
- 2.4.6 Integral Non-Linearity (INL)
- 2.4.7 Absolute Accuracy (Total) Error (AAE)
- 2.4.8 Temperature Stability (Drift), 1/F noise

Fang Xu: Write a draft for the following Test Method sections:

- 2.4.9 Signal-to-Noise Ratio (SNR)
- 2.4.10 Harmonic Distortion, (HD2, HD3)
- 2.4.11 Total Harmonic Distortion (THD)
- 2.4.12 Signal-to-Noise And Distortion ratio (SINAD)
- 2.4.13 Spurious Free Dynamic Range (SFDR)
- 2.4.14 Effective Number Of Bits (ENOB)

David Bergman: Write a draft for the following Test Method sections:

- 2.4.15 Bandwidth (flatness, small and large signal)
- 2.4.24 Transient response
- 2.4.26 Settling Time, large & small signal
- 2.4.32 Jitter

Steve Tilden: Write a draft for the following Test Method sections:

- 2.4.28 Idle Channel noise and SNR
- 2.4.29 Noise Power Ratio
- 2.4.30 Glitch Energy
- 2.4.31 Slew Rate

Pasquale Daponte: Modify the current draft of the DAC standard to incorporate the

changes that Steve Tilden added to the draft that was written by Pasquale. Change the style to include the format document that is being generated by Bob Graham. Add to the digital interface section the following items:

1. Double Rank Flip Flop registers.
2. Byte-Wide registers
3. Nibble-Wide Registers

9. Next Meeting

The next meeting is tentatively scheduled to take place on October 12, and 13, 2004. The site is possibly at Teradyne in Boston.