IEEE 1451.4 Standard Working Group
General Working Group Meeting, October 28-31, 2002
At National Instruments, Austin, Texas
Meeting Minutes, issued November 5, 2002, revised 11-08-02, approved 11-14-02

Chair: T. Licht
Secretary : P. Hufnagel

Oct 28 Attendance:
Garritt Foote, National Instruments, Garritt.Foote@ni.com
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1) Clause 7, Units Definitions:

a) Proposal from G. Foote:

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http://www.1451dot4.com/presentations/102802/1451dot4_units_suggestion.doc
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b) Units notation is an area of disagreement between 1451.3 and 1451.4, which will limit compatibility between the data structures of each Standard.
c) Some conventional units cannot be described in terms of powers of SI base units only, without the use of coefficients and constants.
d) The proposal above adds two fields to the IEEE Std 1451.2 units nomenclature, allowing expressions for constants *m* and *b* to be added to powers of the SI base units.
e) In addition, two enumerated data types are added for inverse logs, allowing quantities to be expressed in terms of $m(log_{10}^{-1}(U)+b)$ and $m(log_{10}^{-1}(U/U)+b)$, as required for "units-per-decade" quantities.
f) The original 1451.2 definition of $log_{10}(U)$ is clarified by the addition of a units reference, U_0 becoming $log_{10}(U/U_0)$, where U_0 is 1?unit, the proper expression for the log unit.
g) **Consensus to place the tabulation of units into subclause 7.4.7, with the explanatory paragraphs to be captured in an annex.**

2) Clause 7, Virtual TEDS:

a) Some confusion exists on the definition of "virtual TEDS".
b) The NI concept is a file, structured according to 1451.4 TEDS, stored in a location other than the EEPROM, addressed as the sensor type and serial number. This is similar to a data structure, to which Endevco refers as PseudoTEDS. These concepts allow TEDS data to be stored outside sensors, which for reasons of operating environment, are unable to contain the TEDS node.
c) The implementation methods for virtual TEDS may be diverse.
d) Basic TEDS is considered to be the identifier for the 1451.4 TEDS. The terminology for the identifier is not presently agreed upon. "UUID" is used by others and defined differently.
e) The uniqueness of the Basic TEDS is in question, in the case of sensor assemblies containing more than one node and more than one sensor, in a single case, with only one serial number and an identical basic TEDS in all nodes. Tri-axial accelerometers are an example. Do these devices require 3 serial numbers?

f) Does virtual TEDS affect the Tier of Compliance? Is another Tier needed to describe a sensor, which is defined by a TEDS, not contained within the sensor? This may depend upon the definition applied to the term “Virtual TEDS”.
g) In sub-clause 7.4.10.2, of Draft 0.982, is there an operating mechanism defined for the property “%virtual_teds”? Would “virtual TEDS” be better named “appended TEDS”?
h) The terms “Virtual TEDS” and “Appended TEDS” need definitions.
i) For TEDS located in other than the sensor, is the Basic TEDS a practical access code, or address?

3) Unique Template Identifier, UTID:
a) The Unique Template Identifier allows the TEDS data to define the template to be used in its interpretation, based upon the selector settings in the TEDS.
b) The derivation of the UTID needs to be in the Standard, although it has been removed from Clause 7. It was last contained in Draft 0.95. The UTID may not be definable when sub-templates are used, because the Basic TEDS is part of the UTID computation, and is not part of the subtemplate. The UTID is needed to allow the unambiguous duplication of TEDS data, using a given template, and also to extract the stored data from TEDS, by application of the proper template. The UTID is also the classification mechanism for templates in a library.
c) Concatenated selectors, formed into a long binary number (17 or more bits), may be converted to either decimal or hex notation, for convenience, or placed in a file (a template-template. No decision on the best way to approach this.
d) Consensus to add a paragraph on the UTID into clause 6, with a detailed description of the format, and the possible addition of a checksum.

4) Clause 7, Extended Functionality:
a) A practical implementation of the ideas contained in sub-clause 7.4.9 has not been proposed, to date. Some of the functions may not be practical, or even possible. Some are not defined clearly. Virtual actuators, the inclusion of a sensor (temperature) within the TEDS node and switch bin(ary) expressions have not been tested.
b) Although the expedient path may be to bypass extended functions, for the present edition, the danger is in proliferation of proprietary templates, not governed by the Standard.
c) Explanatory text is needed in sub-clause 7.4.9.3, dealing with switch masks, to clarify the property syntax constructions. It is not presently clear whether, or not,some of the control fields interact (gain, sens), or which of the parameters is in control (Does gain set sensitivity?).
d) The choice is to wait for C. Jones to comment, or go to ballot, as is, and field any comments, at that time.

5) New Templates:
a) Transducer templates have been defined for voltage, current, resistance, thermocouple, RTD and thermistor. Strain gauge and LVDT templates are also included.
b) Two calibration templates are defined: linear and curved transfer functions. Linearity is assumed in the absence of a definition for curvature.
c) Voltage in DC or RMS volts, and pressure expressed as differential, gauge or absolute, are not easily distinguished from SI units.
d) Flow, viscosity and vacuum are difficult to express. Flow requires definitions of pressure, mass and specific gravity.
e) Current output sensors share some characteristics with voltage output sensors.
f) The expression of accuracy, or uncertainty, of a quantity, must be defined. ISO expresses uncertainty as the general uncertainty measurement (G.U.M.).
g) The resistance template expresses both direct and inverse resistance functions. Max and nominal current are listed.
h) The Wheatstone bridge template is for full bridges only, and specifies excitation voltage.

i) The strain gauge template is similar to the bridge template, but also includes ½ bridge and ¼ bridge definitions, and Poisson and gage factors.
j) The LVDT template expresses sensitivity as V/V/unit, with max and nominal excitation voltage. Question on terminology “min distance”, which might be interpreted as maximum negative distance. Primary impedance needs to be defined, since it determines excitation current, at excitation voltage and frequency.
k) Thermocouple transfer function is set by the type, and is non-linear. Cold junction presence and temperature are included in the TC template.
l) The RTD response is defined by cases of coefficient combinations, or proprietary curves.
m) Thermistors are defined by the coefficients of the Steinhart-Hart curvature equation.
n) A symbol for the unit of acceleration due to Earth’s gravity, 9.8…(m?s^{-2}), is needed. Convention is to use a small, italic “*g*”, which is lost in some programming languages, and may be confused with the SI unit, g = gram. Suggestion “gee” “ag” or “ga” (gravity acceleration), since subscripts are also not desirable.

6) End of day one, 10-28-02, 5:24 pm, CST. Re-convene, 10-29-02, 8:30 am, CST.

7) Dallas Family Codes:
a) Some information on the present devices was received in early 2002.
b) Driver files are needed, to allow expansion to new command sets, but this information isn’t presently in the possession of the Working Group. Dallas Semiconductor may have written an XML file to allow this expansion, and may have some interest in supporting the 1451.4 efforts. DSS: The information required to create an XML file that describes the behavior of a particular 1-Wire device can be completely derived from the datasheet. There is no information that is needed that we do not publish. We can assist if you have particular devices you want to describe. The Dallas TMEX is a driver adaptable to many Dallas parts and may be a prototype adaptable interface. DSS: I think the 1-Wire API for Java is better suited to this. More device specific operation are supported in the API and XML is easily handled natively in Java.
c) The Working Group needs to obtain a signed commitment from Dallas/Maxim, to allow MicroLan? information to be used in, and cited by, the Standard, and to allow registration numbers to be purchased by manufacturers making their own silicon. It is desirable for the Working Group to learn whether new devices are planned, which will not be compatible with the MicroLan? transmission protocol. **Action: D. Potter**. DSS: As stated in our teleconference last week, all new devices will be compatible with the MicroLan protocol.

8) Clause 9:
a) Clause 9 is the specification for the 1451.4 Transducer Block, including Transducer Object Model (TOM), Common Object Interface (COI) and TEDS access services.
b) Also contained is a plan for mapping 1451.4 objects into 1451.1, whose model is convenient for describing transducers.
c) The Clause contains a syntax description for the NCAP.
d) The foundation diagram shows multiple Mixed Mode Interfaces (MMI), numbered 0-n, each with a multi-drop network of Mixed Mode Transducers (MMX), each MMX with a TEDS.
e) The TOM XML diagram show the associations between the 1451.4 Public Transducer, MMI, MMX and TEDS, with restrictions detailed for each association. NIST has requested more detail.
f) Nist requested a terminology change from Common Object Model (COM) to Transducer Block Object Model (TBOM) to prevent confusion with the other standards in the 1451 family.
g) A summary table of Transducer Object Model classes has been added.
h) A Transducer is defined as a single analog channel, with a TEDS.
i) A table of Common Object Interface object classes for communication of commands and triggers, sources and sinks is given in Table 22.

j) TEDS service with a detailed definition of the TBOM operating model is defined in sub-clause 9.1.3.

k) A detailed definition of the MMI software module is contained in sub-clause 9.2.2. The MMI is not presently described with a TEDS, but this may be added, similarly to the meta-TEDS function contained in the 1451.2 STIM and 1451.3 TBIM.

l) The detailed definition of the MMX is contained in sub-clause 9.2.3. The MMX may contain 1-n nodes, each of which may belong to only one MMX, with a file of properties associated with that MMX.

m) Sub-clause 9.2.4 is the detailed definition of the Transducer Channel and all of its associated classes of components. The description of signal conditioners is difficult, presently, and a description of signal conditioners may need to be added. Suggestion made that preamplifier gains may be described as a virtual actuator.

n) A long discussion was held on the effects of more than one TEDS present in a single MMI, such as a microphone and preamplifier, each containing TEDS. Grouping of TEDS must be defined, possibly by way of grouping properties.

o) The term “trigger generator” has been changed to “trigger source”. The clause on trigger operation is not yet complete.

p) Action: A definition of the term “compact TEDS” needs to be added to the Draft. Compact TEDS is not a thing, it is a concept, or technique.

q) Action: C. Lopez will circulate answers to NIST comments on Clause 9, and comments on Grouping, to the Working Group.

9) Dallas Family Codes, Transparent Protocol and 1451.4 Manufacturer Codes:

a) It may be advantageous to include the Dallas Semiconductor <u>Transparent Protocol</u> as an annex to the proposed Standard, since it is a good low level communication tool. *DSS: Not sure what ‘the Dallas Semiconductor’ is here? A. Transparent Protocol.*

b) The Draft may go to ballot with the Dallas Family Codes presently available. **Action: D. Potter will contact Dallas Semi about proposed families of devices, and to formalize the Dallas Semi position on device usage within 1451.4 and licensing of registration numbers.** *DSS: See 17)b) below.*

c) Question from the Chair: Have all manufacturers desiring 1451.4 Manufacturer Codes obtained them, and are all of the names properly represented in the Draft?

10) Formation of sub-groups to review the Draft:

a) Clauses 4 & 6, and the UTID: PJH
b) Clauses 5 & 8, and Annex B: TH, PJH
c) Clause 7 and Annexes C & D: GF, TRL
d) Clause 9: CLR, JJM, EYS
e) Annexes A & E: DP, EEH

11) End of day two, 10-29-02, 5:30 pm, CST. Re-convene, 10-30-02, 8:30 am, CST.

12) Reports of review groups:

a) Templates and Extended Functionality:
   1) Extended Functionality will take more time.
   2) The template list was reviewed, and a template added for ratiometric potentiometers.
   3) What is the deadline for templates to be submitted for inclusion as IEEE templates and what can be done to encourage timely submissions?
   4) An Annex of developmental (0.9x) templates needs to be assembled from manufacturer templates dating to the early 1451.4 program. The unused application register distinguishes early templates. LMS has supplied a template to the Working Group, containing Basic TEDS and a proprietary template.

b) Clause 9:
   1) Some progress reported on preamp/sensor assemblies with multiple TEDS nodes.
   2) The Dot 1 interface still needs to be completed.

c) Clauses 5 & 8, and Annex B:
    1) Primarily editorial changes are needed in these clauses. A mark-up will be forwarded to the Editor.

13) 1451.0 Liaison Meeting:
    a) A Working Group of chairs from the 1451 Family will work to insure commonality within the family of standards.

14) Conventions and Scientific Sessions:
    a) Sensors Expo, June 2-5, 2003, at the Donald E. Stephens Convention Center, Rosemont, Illinois, may be an ideal venue in which to roll-out the 1451.4 Standard. This assumes that the Draft enter balloting by January, 2003, and that at least 75% affirmative votes are returned by March, 2003. While all comments must be answered, the confidence in a good, emerging Standard will be assured. The show management may help with a large display and media coverage.
    b) A rigorous release schedule must be observed to assure balloting in January.

15) Return to Draft review sub-groups.

16) End of day three, 10-30-02, 5:30 pm, CST. Re-convene, 10-31-02, 8:00 am, CST.

17) Dallas Semiconductor Letter:
    a) D. Smiczek and D. Potter phone meeting to be held, 10-31-02.
    b) The email previously received from DSC was not in an IEEE accepted format, and was not signed. *DSS: Just show us the format you need and we will get this done.*
    c) Also, permission to use the MicroLan Transparent Protocol? must be secured, along with the software. *DSS: Permission granted. The license attached to the code is close to 'public domain' as possible.*

18) Transparent Protocol:
    a) The Transparent Protocol allows all of the data transport functions to take place transparently, and is a convenient "tunnel" between the T-Block and the MMI.
    b) A copy of the software was included on the CD of the proceedings of the 2001 General Meeting, held in Austin.

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19) Old Draft:
    a) **Action: T. Licht to submit a copy of an old Draft to IEEE, before Dec 1, 2002.**

20) Schedule for Balloting 1451.4:
    a) Proposed Schedule:

Nov 20, 2002 - Organize a sponsor ballot with IEEE
IEEE membership and IEEE-SA membership are the requirements to become a member of the P1451.4 balloting group.
(You can join IEEE at the IEEE.org website. You can sign up as P1451.4 balloter at:
http://standards.ieee.org/db/balloting/ballotform.html
and then select INSTRUMENTATION & MEASUREMENT SOCIETY. You can sign up either as user, producer, general interest, or government categories. We need well-balanced groups of the above categories. That means no more than 35 % of the balloters in one particular category.)

Dec 12 - Final draft distributed for WG vote

Dec 19 - Working Group vote to approve the draft for balloting.
(Approval requires a 75% quorum of voting members to be present at the time of the vote and an affirmative vote by 75% of those voting.)

Dec 20	- Sponsor ballot group closed
Jan 7	- Send draft to IEEE for balloting
	(Email IEEE the Draft in PDF format, Abstract)
Jan 15	- 1st ballot starts
Feb 15	- Ballot closed
Feb 22	- Ballot comments returned
Mar 25	- WG resolves all comments
Mar 28	- 2^{nd} ballot starts
Apr 15	- Ballot closed
Apr 22	- Ballot passed? Assume yes.
May 1	- Submit draft to RevCom for approval
Jun 2	-Sensors Expo and press release…
Jun 25	- RevCom Decision
Jul 1	- Start working with IEEE editor to prepare standard for publication
Oct 2003	-Publication of the standard

c) **Action: Secretary will notify the Working Group mailing list of the intention to adopt the Draft, by vote, on Thursday, December 19, 2002, to allow lapsed members to reinstate their voting privileges. Five meetings are available to make an attendance of 3 out of four meetings, required for voting privileges.**

d) **Action: The Chair will distribute a final Draft to the mailing list on Thursday, December 12, 2002, for review by the Members of the Working Group.**

e) **Action: All Members of the Working Group should sign up as Balloting Committee Members, as outlined above.**