SEMI E172-0320
SPECIFICATION FOR SECS EQUIPMENT DATA DICTIONARY (SEDD)

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1 Purpose

1.1 The purpose of this Specification is to define the format and content of a dataset that describes key elements of the SECS-II interface for any production equipment. This is a type of documentation, called the SECS Equipment Data Dictionary (SEDD). It is primarily intended as a means for an equipment supplier to provide such documentation to its customers. The customers are expected to use this documentation to streamline the development of the factory software that communicates with the production equipment.

1.2 This Specification is not intended to eliminate the need for traditional paper (or equivalent) equipment interface documentation. This is a supplement to that documentation.

2 Scope

2.1 The SEDD is intended to be a data set that documents key elements of a SECS-II interface. The form in which this data is provided is intended to be comprehensible to both humans and software applications.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 The potential set of information that could be communicated about a SECS-II interface is large. This Specification addresses an important subset of that information. The customer of the production equipment may need additional information about the SECS-II interface to be provided in the traditional paper (or equivalent) format.

4 Referenced Standards and Documents

4.1 *SEMI Standards and Safety Guidelines*

SEMI E5 — Specification for SEMI Equipment Communications Standard 2 Message Content (SECS-II)

SEMI E30 — Specification for the Generic Model for Communications and Control of Manufacturing Equipment (GEM)

SEMI E40 — Standard for Processing Management

SEMI E90 — Specification for Substrate Tracking

SEMI E125 — Specification for Equipment Self Description (EqSD)

SEMI E164 — Specification for EDA Common Metadata

SEMI E173 — Specification for XML SECS-II Message Notation (SMN)

4.2 *W3C Standards*[1]

Extensible Markup Language (XML) 1.1 (Second Edition) – W3C Recommendation 16 August 2006; http://www.w3.org/TR/xml11/

XML Schema Definition Language (XSD) 1.1 Part 1: Structures – W3C Recommendation 5 April 2012

XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes – W3C Recommendation 5 April 2012

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 *Abbreviations and Acronyms*

5.1.1 *RVP* — Recipe Variable Parameter

5.1.2 *SECS* — SEMI Equipment Communications Standard

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5.1.3 *SECS-II* — SEMI Equipment Communications Standard 2

5.1.4 *SEDD* — SECS Equipment Data Dictionary

5.1.5 *SMN* — SECS-II Message Notation [SEMI E173]

5.1.6 *W3C* — Worldwide Web Consortium

5.1.7 *XML* — eXtensible markup language

5.2 *Definitions*

5.2.1 *bit field* — a simple data structure used to store multiple bits, where each bit has a separate logical meaning. Each bit is limited to the values 1 for 'on' and 0 for 'off'. Individual bits are sometimes referred to as 'flags'.

5.2.1.1 *Discussion* — SECS-II does not support bit field data types, but bit fields can be represented by any of the supported data types, such as unsigned integers or binary data.

5.2.2 *collection event* — an event that may be used to initiate the collection and reporting of data. A collection event may trigger an event report. A collection event also may start or stop one or more trace reports. [SEMI E53]

5.2.3 *equipment recipe* — an executable specification of an activity or process on an equipment. The recipe is the user-managed, reusable portion of the set of instructions and settings that determine the processing environment seen by the material. Recipes may be subject to change between runs or processing cycles. An equipment recipe consists of one or more recipe components. [SEMI E157]

5.2.4 *eXtensible markup language (XML)* — a markup language used for representing data rich with context and content in documents and in communications. XML is an extension of SGML, a document-oriented markup language. It was created by W3C for use on the Internet. XML can represent object-oriented structures. [SEMI E120.1]

5.2.5 *host* — the factory computer system or an intermediate system that represents the factory and the user to the equipment. [SEMI E87]

5.2.6 *process job* — a material processing job for a processing resource specifying and tracking the processing to be applied to the material. [SEMI E40]

5.2.7 *production equipment* — equipment used to produce semiconductor devices, including sorting, process, and metrology equipment and excluding material handling and storage equipment. [SEMI E168]

5.2.8 *recipe component* — an executable specification that is managed by the equipment as a separate entity (e.g., file). A recipe component represents all or part of an equipment recipe. For a multipart recipe, a recipe component may be referred to as a subrecipe. A recipe component may contain zero or more recipe steps. [SEMI E157]

5.2.9 *recipe variable parameter (RVP)* — a setting contained in a recipe component whose value can be adjusted by the host for an execution of that recipe without making a permanent change to the recipe.

5.2.9.1 *Discussion* — An RVP can be set using features of SEMI E40 for process job management. SEMI E30 specifies that it can also be set by remote commands from the host. SEMI E30 uses the term 'variable parameter' – see 'variable parameter settings' and CPNAME/CPVAL in SEMI E30, § 4.4. In this Specification, the terms are equivalent.

5.2.10 *SECS Equipment Data Dictionary (SEDD)* — a data set, formatted as an XML file, that contains definitions of key elements of a production equipment's SECS-II interface. This may include such elements as collection events, variables, and alarms.

5.2.11 *subordinate recipe* — a subsidiary component of a multipart recipe. A subordinate recipe is typically executed based upon a command or setting in another equipment recipe.

5.2.12 *variable parameter* — a formally defined variable (setting) defined in the body of a recipe, permitting the actual value to be supplied externally. [SEMI E139]

6 Conventions

6.1 *Requirements Identification*

6.1.1 The following notation specifies the structure of requirement identifiers.

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6.1.1.1 The following requirements prefix format is used at the beginning of requirement text. See Table 1 for the format notation of the requirements prefix.

- [Esss.ss-RQ-nnnnn-nn]

6.1.1.2 To mark the end of the requirement text, the following suffix format is used.

- [/RQ]

6.1.1.3 Requirements in the body text are highlighted with a border and light green background (may appear gray in black and white printouts) as shown below.

[Esss.ss-RQ-nnnnn-nn] Requirement text. [/RQ]

Table 1 Requirement Identifiers

Format Notation	*Purpose*
Esss.ss	SEMI Standards Specification identifier. Examples: E87.00, E87.01, E134.00.
RQ	Indicates this is a requirement identifier.
nnnnn	Unique five-digit number within this Specification. 90000–99999 are reserved for use by SEMI.
nn	Two-digit number that indicates version level of the requirement. A value of .00 is used for the first version of a requirement.
/RQ	Indicates the end of a requirement.

6.1.1.4 Note that the requirements in Appendix 1 use the reserved requirement numbers noted in Table 1 because they are repeated in other SEMI Standards that use this convention.

6.1.2 Requirements in tables are delimited in one of two ways.

6.1.2.1 Where the requirement occupies an entire row in the table, the requirement identifier (RequirementID) is placed in column 1. No '[/RQ]' is used to mark the end of the requirements text in this case. The table may also contain rows that are not requirements. In this case, the column 1 cell is left blank.

6.1.2.2 Non-requirements text related to a requirement row may be included in an adjacent row. The relationship between the rows is indicated by a broken line separating the two.

6.1.2.3 Where the requirement occupies only one cell, the text in the cell includes the RequirementID prefix and suffix similar to requirements in the body text.

6.1.2.4 No cell in a table will contain both requirement and non-requirement text.

6.1.2.5 Cells that contain requirements are shaded light green.

6.1.2.6 Table 2 provides an example of requirements in a table. Note that in this example, the same requirement is presented in two alternative formats. In practice, mixing the two approaches in the same table is not typically done.

Table 2 Example Table With Requirements

RequirementID	*Statement*	*Additional Detail*
Esss.ss-RQ-nnnnn-nn	The light shall be the sole blue light.	There shall be no similar color in the light panel.
	The blue light is typically placed at the leftmost position in the light panel.	
	[Esss.ss-RQ-nnnnn-nn] The light shall be the sole blue light. There shall be no similar color in the light panel. [/RQ]	The blue light is typically placed at the leftmost position in the light panel.

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6.1.3 Only text marked with the RequirementID is a requirement of this Specification.

6.1.3.1 Clarifications, examples, and related recommendations may be provided near a requirement, but are not part of the requirement.

6.1.3.2 Note that the word 'should' is used in some non-requirements text, where it denotes a recommendation or a best practice, not a requirement.

6.1.3.3 Note that the words 'must' and 'will' are used in the Implementation Overview section to illustrate the logical result of requirements specified in the prerequisites and requirements section. Such statements should not be considered requirements.

6.1.4 Parent-child relationships of requirements are noted in Appendix 1, Table A1-1. Where a parent requirement includes conditions or selection criteria, these are passed to their children. For example, if a parent requirement is stated to apply only to photolithography equipment, any child requirements also apply only to such equipment. The condition need not be restated for each child requirement.

6.1.4.1 Compliance to a parent requirement includes compliance to all of its child requirements.

6.1.4.2 Some cells or rows in a table may contain headings that are assigned a RequirementID. These are parent requirements for other requirements in the table—typically for the rows that immediately follow that heading.

7 Implementation Overview

7.1 The SEDD is a means to document key aspects of a production equipment's SECS-II interface. Communication of the information in a precise form that is accessible to both humans and computer applications is the primary goal.

7.2 *XML*

7.2.1 XML is a common technology. It is widely used in many industries. There is extensive support for XML in various software tools from simple editors to software code design and generation.

7.2.2 XML is human readable in its native text form. However, can be even more accessible using inexpensive, widely available tools. For example, XML-aware editors can show XML data in a grid format similar to a spreadsheet. The use of Extensible Stylesheet Language Transformations (XSLT) can be configured transform an XML file in even more convenient formats. Recent versions of Microsoft Excel can also open XML files and present the information adequately.

7.3 *SEDD Expected Use*

7.3.1 In most cases, SEDD files are expected to be created by equipment suppliers and provided to customers, often prior to the arrival of the production equipment at a factory. It is a form of documentation that allows the device makers to better prepare in advance for communicating with the production equipment.

7.4 *Distribution of Requirements*

7.4.1 The structure and content of the SEDD are governed by the requirements defined in this Specification. In this case, there are three forms of requirements:

1. Requirements listed in this document, highlighted in green, as noted in § 6.1.
2. XML schema constructs that constrain the structure and content of XML documents. The applicable XML schema (SEDD schema) is included as a Complementary File (see § 9.2.1).
3. Additional detailed requirements included within that XML schema in xs:Documentation fields. These requirements were considered to be more clear when placed near the XML schema elements to which they refer.

7.5 *SEDD Structure*

7.5.1 Figure 1 illustrates the structure of the SEDD as defined in the SEDD schema. The diagram is a representation of an XML schema using the graphical notation created by Altova GmbH.[2] The specific elements in the diagram are discussed in § 9.5.

[2] The image in Figure 1 was created using Altova XMLSPY®. Copyright 2007-2011 Altova GmbH.

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