

SEMI E142.4-1022 (Reapproved 0224) SPECIFICATION FOR SECS II PROTOCOL FOR SUBSTRATE MAPPING USING ITEM TRANSFER

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NOTICE: The section symbol (§) is used to reference a numbered section, paragraph, or header and all subordinate paragraphs, headers, and embedded material (i.e., EXCEPTIONs, lists) therein. The paragraph symbol (§) is used to reference a particular numbered paragraph and embedded material therein. When duplicated (i.e., §§ and §§) the symbols are used to reference more than one section or paragraph, respectively.

1 Purpose

1.1 This Specification maps the services of SEMI E142 to SECS-II Stream 21 messages and data items.

2 Scope

2.1 This Specification applies to all implementations of SEMI E142 that use Stream 21 message set of SECS-II message protocol (SEMI E5) for substrate mapping services defined in SEMI E142.

2.2 The MapData parameter, also known as the substrate map data, specified in the SEMI E142 services is a single item that complies with the SEMI E142.1 XML Schema.

2.3 This Specification defines an alternative to the SEMI E142.2 SECS-II Protocol for Substrate Mapping specification which also defines how to implement SEMI E142 services using SECS-II messages. By using Stream 21 messages in this Specification, the size of the substrate map data is not limited to 16777215 bytes like a SEMI E142.2 implementation. Stream 21 messages allow the substrate map data to be significantly larger.

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 None.

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 Communication and Control of Manufacturing Equipment (GEM)

SEMI E40 — Specification for Processing Management

SEMI E90 — Specification for Substrate Tracking

SEMI E142 — Specification for Substrate Mapping

SEMI E142.1 — Specification for XML Schema for Substrate Mapping

SEMI E142.2 — Specification for SECS-II Protocol for Substrate Mapping

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

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

5 Terminology

5.1 None.

6 Conventions

6.1 Requirements Identification

6.1.1 The following notation specifies the structure of requirement identifiers.

6.1.1.1 The following requirements prefix format is used at the beginning of requirement text. Refer to Table 1 for the format notation of the requirements prefix: [Esss.ss-RQ-nnnnnn-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-nnnnnn-nn] Requirement text. [/RQ]

Table 1 Requirement Identifiers

<i>Format Notation</i>	<i>Purpose</i>
Esss.ss	SEMI Standards Specification identifier. Examples: E87.00, E87.01, E134.00.
RQ	Indicates this is a requirement identifier.
Nnnnnn	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

<i>RequirementID</i>	<i>Statement</i>	<i>Additional Detail</i>
Esss.ss-RQ-nnnnnn-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-nnnnnn-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.

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 Requirements

7.1 Equipment Communication

[E142.04-RQ-00001-00] Transfer of a substrate map data between host and equipment shall use the SECS I or HSMS communication protocol. [/RQ]

7.2 Services Mapping

[E142.04-RQ-00002-00] The services shall use the SEMI E5 Stream 21 Item Transfer messages listed below in Table 3. [/RQ]

7.2.1 Table 3 summarizes the specific SECS II streams and functions used for the SECS II implementation of the services defined in SEMI E142. For each service, there are several alternatives.

7.2.2 Equipment initiated behavior is configured by an equipment constant.

Table 3 Service Message Mapping

<i>Service Name</i>	<i>Technique Stream, Functions</i>	<i>Description</i>
MapDownload	Equipment Initiated Single Message S21F5/6	Equipment sends S21F5 to request the map data. If accepted the host returns the map data in the S21F6 reply message.
	Equipment Initiated Multiple Message S21F15/16 and S21F17/18	Equipment sends S21F15 to request the map data. If accepted, the host sends the map data using S21F17 messages.
	Host Initiated Single Message S21F1/F2 and S21F3/F4	Host sends S21F1 to request permission to send the map data to the equipment. If accepted, the host sends S21F3 with the map data.
	Host Initiated Multiple Message S21F13/14 and S21F17/18	Host sends S21F13 to request permission to send the map data to the equipment. If accepted, the host sends the map data using S21F17 messages.

<i>Service Name</i>	<i>Technique Stream, Functions</i>	<i>Description</i>
MapUpload	Equipment Initiated Single Message S21F1/F2 and S21F3/F4	Equipment sends S21F1 to request permission to send map data. If accepted, the equipment sends the map data using S21F3.
	Equipment Initiated Multiple Message S21F13/F14 and S21F17/F18	Equipment sends S21F13 requesting permission to send map data. If accepted, the equipment sends the map data using S21F17 messages.
	Host Initiated Single Message S21F5/6	Host requests map data using S21F5. If accepted, the equipment returns the map data in the S21F6 reply message.
	Host Initiated Multiple Message S21F15/16 and S21F17/18	Host requests map data using S21F15. If accepted, the equipment sends map data using S21F17 messages.
MapGroupDownload		This service is not supported in this Specification.

7.3 Stream 21 Message Usage

7.3.1 Stream 21 Item Transfer messages were added to SEMI E5 for transferring small and large substrate map data. When transferring large data that cannot be stored in a single SECS-II data item, the Stream 21 messages allow the data to be split into smaller item parts for transfer, where each part is transferred as a separate ITEM PART data item in one or more messages. It is assumed that the receiver of the item parts will concatenate the item parts to recreate the whole item. Refer to SEMI E5 for details.

7.3.2 Stream 21 Transfer Techniques

7.3.2.1 SEMI E5 defines two Stream 21 transfer techniques:

- Single Message technique (S21F5/F6 or S21F1/F2 followed by S21F3/F4)
- Multiple Message technique (S21F15/F16 or S21F13/F14 followed by one or more S21F17/F18 messages).

[E142.04-RQ-00003-00] Equipment shall support at least one of the Stream 21 transfer techniques for transferring substrate map data. [/RQ]

[E142.04-RQ-00004-00] Equipment shall support message S21F19/F20 defined in SEMI E5 to indicate which Stream 21 messages are accepted for each supported ITEM TYPE. [/RQ]

[E142.04-RQ-00005-00] Stream 21 shall be used to transfer substrate map data for a single substrate. Substrate map data for multiple substrates shall be transferred independently using the Stream 21 messages. [/RQ]

7.3.3 ITEM TYPE Definition

7.3.3.1 The SEMI E5 ITEM TYPE data item identifies the type of item to be transferred with Stream 21 messages.

[E142.04-RQ-00006-00] The ITEM TYPE value in Stream 21 messages shall use the format:

SEMI:SUBSTRATEMAPDATA:<SubstrateType>

where <SubstrateType> is replaced by the E142 SubstrateType in all upper case. Refer to SEMI E142 for the definition of and possible values for SubstrateType. [/RQ]

[E142.04-RQ-00007-00] The equipment shall support message S21F9 to inform the host the specific ITEM TYPE values which are supported. [/RQ]

7.3.3.2 ITEMYPE Examples

- If the SubstrateType is 'Wafer', the ITEMYPE is specified as 'SEMI:SUBSTRATEMAPDATA:WAFER'
- If the SubstrateType is 'Tray', the ITEMYPE is specified as 'SEMI:SUBSTRATEMAPDATA:TRAY'

7.3.3.3 Scenario where Host requests supported ITEMYPE:

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests the list of supported ITEMYPE values.	S21F9-->		
		<--S21F10	Equipment returns the list of supported ITEMYPE values.

7.4 Service Parameter Mapping

7.4.1 Table 4 maps the service parameters defined in SEMI E142 to the SECS-II Data Items used, the SECS-II Type and value range.

Table 4 Service Parameter Mapping Table

Parameter Name	Required	Data Item	Notes
SubstrateId	Y	ITEMID	SECS-II Format: 20 Identifier of substrate
SubstrateType	Y	ITEMYPE	SECS-II Format: 20 Refer to § 7.3.3 for details.
MapData	Y	ITEMPART	SECS-II Format: 10 Substrate map data
			[E142.04-RQ-00008-00] MapData shall be formatted in XML according to the SEMI E142.1 XML Schema for the specified SubstrateId (ITEMID) and SubstrateType. [/RQ]
			[E142.04-RQ-00009-00] The sum of the ITEMPART data items shall be the MapData. [/RQ]
			[E142.04-RQ-00010-00] The MapData shall include the substrate map data for the specified substrate. [/RQ]
	Y	ITEMVERSION	SECS-II Format: 20 Formatted as a timestamp per ITEMVERSION definition in SEMI E5.
			[E142.04-RQ-00011-00] The ITEMVERSION value shall indicate a timestamp when the MapData was last modified. [/RQ]
			[E142.04-RQ-00012-00] The substrate map data ITEMVERSION value shall be retained when the substrate map data is transferred with an upload or download service. A new timestamp shall be assigned when the substrate map data is changed. [/RQ]
			For example, if the MapData is stored as a file, then the file's last modified timestamp could be adjusted to match the value specified in the ITEMVERSION.

7.5 MapDownload Service

7.5.1 Overview

7.5.1.1 Stream 21 messages are used for the MapDownload service; either equipment or host initiated.

7.5.1.2 Equipment behavior is configured using equipment constant E142MapDownload.

7.5.1.3 The equipment can still respond to a host initiated MapDownload service, regardless of the E142MapDownload value.

7.5.1.4 The host behavior is outside the scope of this Specification.

7.5.2 Requirements for the MapDownload Service

[E142.04-RQ-00013-00] The equipment GEM interface shall include an equipment constant called E142MapDownload with SECS-II format 51 to configure the equipment's MapDownload behavior using the values in Table 5. [/RQ]

[E142.04-RQ-00014-00] The equipment shall support at least one of E142MapDownload value 2 or 3. [/RQ]

Table 5 E142MapDownload Equipment Constant Values

<i>Value</i>	<i>Description</i>
0	Equipment does not initiate the MapDownload service.
1	Equipment uses SEMI E142.2 to implement the MapDownload service
2	Equipment initiates a MapDownload service using scenario § 7.5.3, Equipment Initiated MapDownload Scenario Using Single Message Technique
3	Equipment initiates a MapDownload service using scenario § 7.5.4, Equipment Initiated MapDownload Scenario using Multiple Message Technique.
4	Equipment initiates a MapDownload service using SEMI E142.3 web services.

[E142.04-RQ-00015-00] When the value of equipment constant E142MapDownload is 2, the equipment shall support scenario § 7.5.3, Equipment Initiated MapDownload Scenario Using Single Message Technique. [/RQ]

[E142.04-RQ-00016-00] When the value of equipment constant E142MapDownload is 3, the equipment shall support scenario § 7.5.4, Equipment Initiated MapDownload Scenario using Multiple Message Technique. [/RQ]

7.5.3 MapDownload Equipment Initiated Single Message Scenario:

COMMENT	HOST	EQUIPMENT	COMMENT
			Equipment Constant E142MapDownload value is 2.
			Equipment requires substrate map data.
		<--S21F5	Equipment requests the substrate map data for a specific substrate ID.
Host returns the substrate map data.	S21F6-->		