

# SEMI E90.1-0624

## SPECIFICATION FOR SECS-II PROTOCOL SUBSTRATE TRACKING

This Standard was technically approved by the Information & Control Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on December 14, 2024. Available at [www.semiviews.org](http://www.semiviews.org) and [www.semi.org](http://www.semi.org) in June 2024; originally published March 2001; previously published September 2021.

### 1 Purpose

1.1 This Specification maps the services and data of SEMI E90 to SECS-II streams and functions, and data definitions.

### 2 Scope

2.1 This Specification covers equipment supporting automated substrate tracking.

2.2 This Specification applies to all implementations of SEMI E90 that use the SECS-II message protocol (SEMI E5). Compliance to this Standard requires compliance to both SEMI E90 and SEMI E5.

**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 Referenced Standards and Documents

3.1 *SEMI Standards and Safety Guidelines*

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

SEMI E39.1 — Specification for SECS-II Protocol for Object Services (OSS)

SEMI E90 — Specification for Substrate Tracking

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

### 4 Mapping

4.1 This section shows the specific SECS-II streams and functions that shall be used for SECS-II implementation of the services defined in SEMI E90, as well as the parameter mapping for data attached to services.

#### 4.2 Message Mapping

4.2.1 *Services Message Mapping* — Table 1 defines the relationships between SEMI E90 services and SECS-II messages.

4.2.2 *Event Message Mapping* — Table 2 defines the relationships between SEMI E90 collection events and SECS-II messages.

**Table 1 Services Message Mapping Table**

| Service Name          | Stream, Function | SECS-II Message Name                           |
|-----------------------|------------------|------------------------------------------------|
| registers substrate   | S14,F9/10        | Create Object Request/Acknowledge (SEMI E39.1) |
| remove substrate      | S14,F11/12       | Delete Object Request/Acknowledge (SEMI E39.1) |
| UpdateSubstrateObject | S14F19/F20       | Generic Service Request/Acknowledge            |
| ProceedWithSubstrate  | S14F19/F20       | Generic Service Request/Acknowledge            |
| CancelSubstrate       | S14F19/F20       | Generic Service Request/Acknowledge            |

**Table 2 Event Message Mapping Table**

| <i>Event Name</i>           | <i>Stream, Function</i> | <i>SECS-II Message Name</i>   |
|-----------------------------|-------------------------|-------------------------------|
| All state model transitions | S6F11/12                | Event Report Send/Acknowledge |

4.3 *Parameter Mapping* — Table 3 defines the relationships between SEMI E90 service parameters and SECS-II data definitions.

**Table 3 Service Parameters to SECS-II Data Items Mapping**

| <i>Parameter Name</i>       | <i>Range</i>                                                                            | <i>SECS-II Data Item</i>                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AdditionalInfo              | List of structure with name-value pairs.                                                | L,n<br>1. L,2<br>1. AdditionalInfoName <sub>1</sub><br>2. AdditionalInfoValue <sub>1</sub><br>:<br>n. L,2<br>1. AdditionalInfoName <sub>n</sub><br>2. AdditionalInfoValue <sub>n</sub><br><br>AdditionalInfoName <sub>i</sub> is Format Code 20, and is limited to 1–256 characters.<br>AdditionalInfoValue <sub>i</sub> is Format Code 0, 10, 11, 20, 3(), 4() or 5(). |
| ErrorCode                   | Enumerated                                                                              | ERRCODE                                                                                                                                                                                                                                                                                                                                                                 |
| ErrorText                   | 1 to 80 characters                                                                      | ERRTEXT                                                                                                                                                                                                                                                                                                                                                                 |
| ObjectAction                | 'UpdateSubstrateObject'                                                                 | SVCNAME                                                                                                                                                                                                                                                                                                                                                                 |
| ObjectActionStatus          | List of service acknowledge and status.                                                 | L,2<br>1. SVCACK<br>2. Status                                                                                                                                                                                                                                                                                                                                           |
| ObjectActionParameterResult | (List of) name value pairs providing information about the attributes successfully set. | L,n<br>1. L,2<br>1. SPNAME <sub>1</sub><br>2. SPVAL <sub>1</sub><br>:<br>n. L,2<br>1. SPNAME <sub>n</sub><br>2. SPVAL <sub>n</sub>                                                                                                                                                                                                                                      |
| ObjectLinkID                | 51                                                                                      | LINKID                                                                                                                                                                                                                                                                                                                                                                  |
| OperationID                 | 51                                                                                      | OPID                                                                                                                                                                                                                                                                                                                                                                    |
| STAcknowledge               | 0 if success; 1 if error<br>(Conforms to ObjAck in SEMI E39.1)                          | OBJACK                                                                                                                                                                                                                                                                                                                                                                  |
| Status                      | List of error information.                                                              | L,n n = number of errors<br>1. L,2<br>1. <ErrorCode <sub>1</sub> ><br>2. <ErrorText <sub>1</sub> ><br>.<br>.<br>n. L,2<br>1. <ErrorCode <sub>n</sub> ><br>2. <ErrorText <sub>n</sub> >                                                                                                                                                                                  |

| <i>Parameter Name</i>                   | <i>Range</i>                                                                            | <i>SECS-II Data Item</i>                                                                                                                                     |
|-----------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| STStatus                                | STAcknowledge and Status.                                                               | L,2<br>1. <STAcknowledge><br>2. <Status>                                                                                                                     |
| SubstID                                 | 1–80 characters (Conforms to ObjID in SEMI E39.1)                                       | OBJID                                                                                                                                                        |
| SubstIDList<br>(ordered list of)        | List of Substrate IDs.                                                                  | L,n n = number of substrate identifiers<br>1. <SubstID <sub>1</sub> ><br>.<br>.<br>n. <SubstID <sub>n</sub> >                                                |
| SubstLocID                              | 1–80 characters (Conforms to ObjID in SEMI E39.1)                                       | OBJID                                                                                                                                                        |
| SubstLocIDList<br>(ordered list of)     | List of Substrate Location ID's corresponding to the SubstIDList (ordered list of).     | L,n n = number of substrate identifiers in SubstIDList (ordered list of)<br>1. <SubstLocID <sub>1</sub> ><br>.<br>.<br>n. <SubstLocID <sub>n</sub> >         |
| SubstProcState                          | Enumerated per Variable SubstProcState                                                  | U1                                                                                                                                                           |
| SubstProcStateList<br>(ordered list of) | List of Substrate Processing States corresponding to the SubstIDList (ordered list of). | L,n n = number of substrate identifiers in SubstIDList (ordered list of)<br>1. <SubstProcState <sub>1</sub> ><br>.<br>.<br>n. <SubstProcState <sub>n</sub> > |
| SubstrateObject-<br>Attributes          | List of substrate object attribute names and values.                                    | L,n<br>1. L,2<br>1. SPNAME <sub>1</sub><br>2. SPVAL <sub>1</sub><br>.<br>n. L,2<br>1. SPNAME <sub>n</sub><br>2. SPVAL <sub>n</sub>                           |
| SubstState                              | Enumerated per Variable SubstState                                                      | U1                                                                                                                                                           |
| SubstStateList<br>(ordered list of)     | List of Substrate Transport States corresponding to the SubstIDList (ordered list of).  | L,n n = number of substrate identifiers in SubstIDList (ordered list of)<br>1. <SubstState <sub>1</sub> ><br>.<br>.<br>n. <SubstState <sub>n</sub> >         |

4.4 *SECS-II Data Items Without Corresponding SEMI E90 Parameters* — Table 4 contains the SECS-II data items that do not correspond to SEMI E90's service parameter.

**Table 4 Additional Data Item Requirements Table**

| <i>Function</i>                                    | <i>SECS-II Data Item</i>                                                                                      |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| TimeIn from SubstHistory variable data definition  | TIMESTAMP                                                                                                     |
| TimeOut from SubstHistory variable data definition | A[0] if the substrate(s) remain in the location.<br>TIMESTAMP if the substrate(s) have departed the location. |

## 5 Variable Data Item Mapping

5.1 Table 5 shows the specific SECS-II data classes, and formats needed for SECS-II implementations of SEMI E90 variable data items.

**Table 5 Variable Data Item Mapping**

| <i>Variable Name</i>       | <i>Class</i> | <i>Format</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AcquiredID                 | DVVAL        | A[1..80] (Conforms to ObjID in SEMI E39.1)                                                                                                                                                                                                                                                                                                                                                                                                                            |
| AcquiredIDList             | DVVAL        | <p>L,n</p> <p>1. &lt;AcquiredID<sub>1</sub>&gt;</p> <p>.</p> <p>.</p> <p>n. &lt;AcquiredID<sub>n</sub>&gt;</p> <p>n = the number of substrates involved in the related state model transition.<br/>AcquiredID<sub>i</sub> has the same format as variable AcquiredID listed in this table.</p>                                                                                                                                                                        |
| AdditionalInfo             | DVVAL        | <p>L,n n = number of substrate additional information name-value pairs</p> <p>1. L,2</p> <p>1. AdditionalInfoName<sub>1</sub></p> <p>2. AdditionalInfoValue<sub>1</sub></p> <p>:</p> <p>n. L,2</p> <p>1. AdditionalInfoName<sub>n</sub></p> <p>2. AdditionalInfoValue<sub>n</sub></p> <p>AdditionalInfoName<sub>i</sub> is Format Code 20, and is limited to 1–256 characters.<br/>AdditionalInfoValue<sub>i</sub> is Format Code 0, 10, 11, 20, 3(), 4() or 5().</p> |
| AdditionalInfoList         | DVVAL        | <p>L,m m = the number of substrates involved in the related state model transition.</p> <p>1. &lt;AdditionalInfo<sub>1</sub>&gt;</p> <p>.</p> <p>.</p> <p>n. &lt;AdditionalInfo<sub>m</sub>&gt;</p> <p>AdditionalInfo<sub>i</sub> has the same format as variable AdditionalInfo listed in this table.</p>                                                                                                                                                            |
| BatchLocID                 | DVVAL        | A[1..80] (Conforms to ObjID in SEMI E39.1)                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BatchLocID <sub>i</sub>    | SV           | A[1..80] (Conforms to ObjID in SEMI E39.1)                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BatchLocState              | DVVAL        | <p>51(U1)</p> <p>Enumerated as:</p> <p>0-UNOCCUPIED</p> <p>1-OCCUPIED</p>                                                                                                                                                                                                                                                                                                                                                                                             |
| BatchLocState <sub>i</sub> | SV           | <p>51(U1)</p> <p>Enumerated as:</p> <p>0-UNOCCUPIED</p> <p>1-OCCUPIED</p>                                                                                                                                                                                                                                                                                                                                                                                             |
| BatchSubstIDMap            | DVVAL        | <p>L,n n = number of positions in a batch</p> <p>1. &lt;SubstID<sub>1</sub>&gt;</p> <p>.</p> <p>.</p> <p>n. &lt;SubstID<sub>n</sub>&gt;</p>                                                                                                                                                                                                                                                                                                                           |