ams OSRAM
Substrate Mapping & Validation
Functional Specification

am∷ OSRAM

Contents

ams OSRAM Substrate Mapping & Validation Functional Specification

List of Tables

List of Figures

1   INTRODUCTION

Substrate Mapping & Validation Functional Specification will be subset of Global Tool Operation Specification. The specification will be changed or improved from time to time therefore it is always important to contact / email OT SEMI personnel for the latest version.

1.1   Purpose of the Document

The primary objective of this specification is to establish the substrate mapping format and methodology to be implemented across the global production environment of ams OSRAM. This document will serve as a guideline for equipment suppliers, facilitating substrate mapping exchanges between equipment and host systems. Although the specification is primarily based on SEMI E142 standards, it also addresses unique scenarios specific to Back End production, particularly concerning the management of device and chip-level information.

1.2   Target Audience

This document is supposed to be read and followed by internal and external equipment suppliers and developers, who sell / develop equipment / applications to ams OSRAM production. It is prepared in consideration of the ams OSRAM equipment integration needs. Strict compliance is expected.

1.3   Roles & Responsibility

Equipment Purchaser/Owner:

i.   Send the specification to the Equipment Supplier to perform characterization.

ii.   To make procurement decision based on review result CIM Engineer based on this document.

iii.   **ENSURE THE VENDOR FULFILL requirements documentation and send via email as based in Chapter 8: Project Processing Requirements**

Equipment Vendor:

i.   To perform off-site characterization on the equipment as per the documentation.

ii.   Perform software modifications to fulfill the requirements documentation.

iii.   **ENSURE EQUIPMENT FULFILLS ALL RELEVANT SEMI STANDARDS.**

iv.   **ENSURE MANUAL OPERATION IS NOT ALLOWED IN REMOTE MODE and vice versa.**

v.   **ENSURE FULFILL the requirement documentation and send all attachment to ams OSRAM via email prior to procurement finalization.**

CIM Engineer:

i.   To perform validation and review this document prior to equipment procurement.

ii.   To perform on-site characterization if need be, to evaluate equipment readiness for procurement.

iii.   To advice equipment capability for procurement based on validation result.

iv.   To perform equipment buy-off against this document upon equipment arrival.

1.4   Limitations

Substrate Mapping & Validation Functional Specification is applicable for ams OSRAM Worldwide Front End and Back End only.

2   TERMS AND DEFINITIONS

2.1   Definition of Substrate Maps

Substrate maps are two dimensional arrays of data that correspond to physical substrate which may be strips, trays, or wafers.

2.2   Substrate for ams OSRAM

2.2.1   Definition of IDs

IDs are unique identifiers for substrate and will be controlled by ams OSRAM shop floor control. SubstrateId is the only identifier use during equipment handling.   All operation / handlings are individual substrate based.

2.2.2   2D Format

ams OSRAM production follows T9-0200E's 2D Format. The 2D specification is as followed:

- Code Type   : Data Matrix
- Error Correction Level   : ECC200 (Reed-Solomon code)
- Symbol Dimension   : 2.0 x 1.0 mm (+/- 0.2mm)

  2.0 x 2.0 mm (+/- 0.2mm)

  2.4 x 2.4 mm (+/- 0.2mm)
- Symbol Size   : Any
- Mark color   : Light on dark

For details, please refer to SEMI T9 standard.

2.2.3   Location of ID on the Substrate

It is according to product design of ams OSRAM.

2.2.4   Types of Substrate

Only apply to following type of substrate:

- Panels
- Frames
- Wafers
- Strips
- Trays

2.3   Status of Equipment "Offline-Mode"

"Offline-Mode"refers to the ability of Equipment to be able to operate without network connection. This is strictly not supported for productive materials, though equipment must support such mode for engineering mode. Equipment should be able to generate map data and stored locally for 30 days at a predefined location: named as Substrate/MapData/

Additionally, in engineering mode, equipment must be able to load maps from external media to be processed.

2.4   Constraints, Changes and Conventions Over E142

2.4.1   MapData

The MapData object contains a list of zero or more Layout objects, a list of zero or more SubstrateMap objects.

2.4.2   Layout

The full definition of a substrate layout is tree of the layouts that share a common "root" or "top level" layout. Each Layout object defines the logical and physical dimensions of two-dimensional array of devices to which a SubstrateMap may be assigned. Any layout object can reference other child layout objects. The top-level layout defines the overall size of the substrate that is being mapped (e.g., the wafer diameter or the strip length and width).

Substrate   = Represent the whole Substrate / TopLevel

Unit   = Represent each location

Chip   = Represent each die
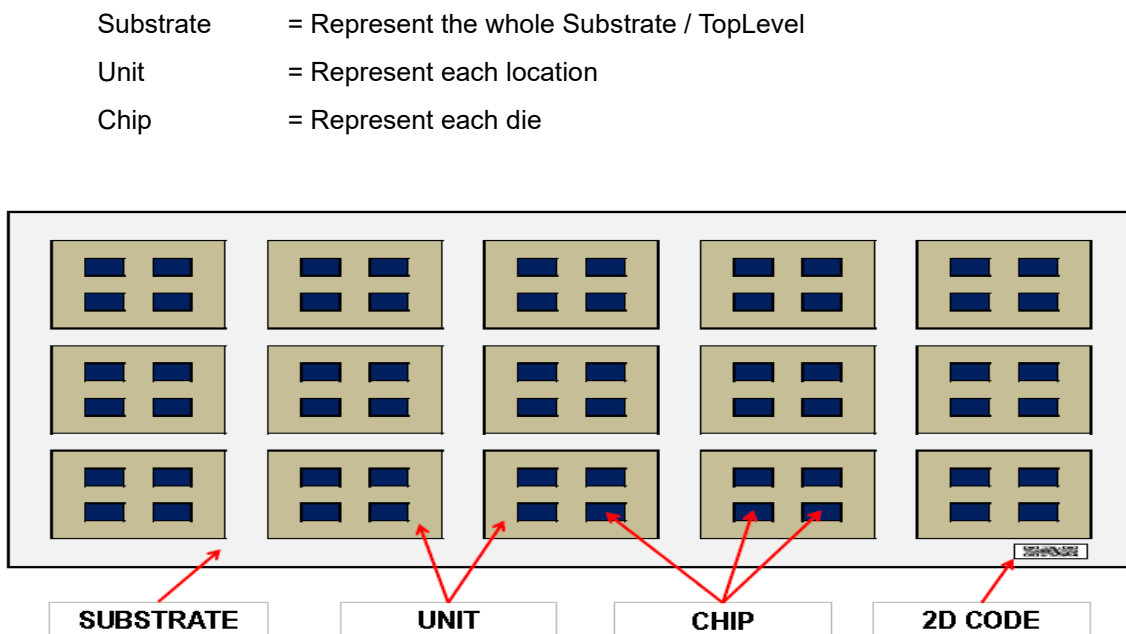
Figure 1: Layout Definition

2.4.3 Substrate

The Substrate object identifies a substrate to which a SubstrateMap may be assigned. A Substrate object may have one or more AliasId objects.

2.4.4 Overlay

For now, this standard only supports 3 overlays maximum, with below strings as MapName attribute of the Overlay.

- BinCodeMap
- DeviceIdMap
- TransferMap

One Overlay can have only one of above map types (multiple maps within 1 overlay is not allowed except for TransferMap), and different versions of overlays are not supported. Only the latest version will be stored / retrieved.

2.4.5 BinDefinition, BinQuality and Pick

Host and equipment must agree on which bin code is good, which is bad, and which is not process, therefore BinDefinition must be present and so is BinQuality as definition:

Attribute Name	Definition	Access	Reqd	Form
BinQuality	Describes the quality of the specified BinCode. The following values are reserved: - "Pass" – Indicates a quality that has commercial value - "Fail" – Indicates a quality that does not have commercial value	RO	Y	Text

Table 1: Bin Quality Definition

BinQuality has a relationship with Pick attribute: If value of Pick attribute is "true", the BinQuality value must be "Pass", while the other way is not always true. But anyway, equipment should only process the bins marked with Pick=true, regardless of BinQuality.

As a convenient convention, map must always mark "Pass" bins, and if a bin is not defined by BinDefinition, nor is a NullBin defined with BinCodeMap, it is treated as "Fail" by default.

9

2.4.6   General Limitations

i.   1 MapData can only contain 1 <Substrate>

ii.   1 MapData must have at least 2 <Layout> which consists of, 1 TopLevelLayout for the Substrate and 1 Child Layout for Unit.

iii.   1 Substrate could have at least 1 <SubstrateMap> and can have maximum of 2 <SubstrateMap> which consist of 1 for TopSide and 1 for BottomSide.

iv.   1 <SubstrateMap> is referring to only 1 <Layout> (defined in LayoutSpecifier)

v.   1 <SubstrateMap> must have at least 1 <Overlay> (Refer to Chapter 2.4.4: Overlay)

vi.   1 <BinCodeMap> must have at least 1 <BinDefinition> with "Pass" as <BinQuality> (Refer to Chapter 2.4.5: BinDefinition, BinQuality and Pick)

3   GENERAL SCENARIOS

3.1   Substrate Processing

The following description in this section only applies to the Equipment that process substrate with ID.

3.1.1   Normal Process

Upon substrate loaded into equipment, the equipment must request for substrate map from host before start processing. Only 1 SubstrateId is allowed in a request. This operation can be done while equipment is in Online-Remote and Online-Local.

COMMENT	HOST		EQPT	COMMENT
				The Equipment scans SubstrateId. **[IF]** Equipment able to read SubstrateId **[THEN]** The Equipment request MapData from Host (S14F1) **[ELSE..IF]** Equipment failed to read SubstrateId **[THEN]** Refer to 3.2.3: Case 3 **[ELSE]** Refer to 3.2.1: Case 1
		←	S14F1	Get Attributes Request with • OBJTYPE='Substrate' • OBJID= *<SubstrateId>* • ATTRID='SubstrateType' • ATTRDATA = *<substrate type>*
[IF] MapData is valid [**THEN**] Host reply ObjAck=0 and provide the MapData (in xml) for processing. [**ELSE**] Host reply ObjAck=1 and equipment should not process the substrate.	S14F2	→		
				[IF] ObjAck=0 and equipment accepted attributes

11

				[**THEN**] Equipment start processing the substrate [**ELSE .. IF**] ObjAck=0 and equipment rejected attributes [**THEN**] Refer to 3.2.1: Case 1. [**ELSE**] ObjAck = 1 then refer to 3.2.1: Case 1.
				The Equipment start processing
		←	S6F11	[**IF**] Network is down, refer to 3.4: Failure Handling [**ELSE..IF**] Substrate aborted before complete process [**THEN**] Equipment upload MapData for the processed unit contain: 1. SubstrateId 2. SubstrateType 3. SubstrateMap [**ELSE**] The Equipment finished processing the substrate, and upload MapData that contain: 1. SubstrateId 2. SubstrateType 3. SubstrateMap
Host will update good and bad unit in host mapping system based on the MapData uploaded by Equipment.				
				[**IF**] No S6F12 reply from Host, refer to 3.4 Failure Handling.
[**IF**] The data is valid [**THEN**] Host Acknowledge with ACKC6 = 0 [**ELSE**] Host Acknowledge with ACKC6 = 1	S6F12	→		
				[**IF**] ACKC6 = 0

				[**THEN**] Equipment shall start the next substrate. [**ELSE**] Refer to 3.2.2: Case 2.

Table 2: Normal Process Scenario

3.2 Exception Handling

3.2.1 Case 1

Condition:

- Equipment scanner timeout.
- S14F2 with ObjAck = 1.
- S14F2 with ObjAck = 0 with Equipment reject attributes.

COMMENT	HOST		EQPT	COMMENT
		←	S5F1	Equipment sends alarm report.
Host Acknowledge.	S5F2	→		
				Equipment shall send the Substrate back to original input location and STOP processing and wait for operator judgment.

Table 3: Exception Handling for Case 1

To be filled by Equipment vendor:

ALARM ID (ALID)	ALARM DESCRIPTION (ALTX)
	Scanner timeout
	Invalid MapData XML format
	SubstrateId Mismatch
	Host reject MapData Request

Table 4: Alarm ID for Case 1

3.2.2 Case 2

Equipment STOP processing and wait for operator judgment. Operator can choose either 'RETRY' or 'ABORT' the lot processing.

13

3.2.3 Case 3

Condition:

- Equipment failed to read SubstrateId

COMMENT	HOST		EQPT	COMMENT
		←	S5F1	Equipment sends alarm report.
Host Acknowledge.	S5F2	→		
				Equipment popup a screen for operator to select list of substrate id given by host earlier (through PP-Select command). Equipment will only list out substrate id that have not process yet.

Table 5: Exception Handling for Case 3

To be filled by Equipment vendor:

ALARM ID (ALID)	ALARM DESCRIPTION (ALTX)
	Fail to read SubstrateId

Table 6: Alarm ID for Case 3

3.3   MapData Examples

3.3.1   Equipment Request for MapData, S14F1

3.3.1.1   Strip Type

Equipment request MapData for SubstrateId "1234":

```
S14,F1 GetAttr Request (GAR) S,H<-E
L,5
        <OBJSPEC = '' >
        <OBJTYPE = 'Substrate'>
        L,1
            <OBJID = '1234'>
        L,1
            L,3
                <ATTRID = 'SubstrateType' >
                <ATTRDATA = 'Strip' >
                <ATTRRELN = 0 >
        L,1
            <ATTRID = "MapData">
```

Figure 2: Equipment Request for MapData (Strip Type)

3.3.1.2   Wafer Type

Equipment request MapData for WaferID "Wafer1":

```
S14,F1 GetAttr Request (GAR) S,H<-E
L,5
        <OBJSPEC = ' ' >
        <OBJTYPE = 'Substrate'>
        L,1
             <OBJID = 'Wafer1'>
        L,1
             L,3
                     <ATTRID = 'SubstrateType' >
                     <ATTRDATA = 'Wafer' >
                     <ATTRRELN = 0 >
        L,1
           <ATTRID = "MapData">
```

Figure 3: Equipment Request for MapData (Wafer Type)

This service shall use the SEMI E39.1 Object Services Streams and Functions to download MapData for a single substrate. The MapData is returned as a single value formatted according to the SEMI E142.1 XML Schema.

Table below maps the service parameters defined in SEMI E142 to the SECS II Data Items used along with their SECS II Type and value range.

Parameter Name	Required	Data Item	SECS II Type and Range
-	Y	OBJSPEC	Not used
-	Y	OBJTYPE	= 'Substrate'
SubstrateId	Y	OBJID	20. Identifier of substrate
SubstrateType	Y	ATTRID	20. Type of substrate
MapData	Y	ATTRDATA	10. Requested formatted in XML according to the SEMI E142 XML Schema for OSRAM

Table 7: Map Download Service Parameter Mapping Table

3.3.2 Host Reply MapData to Equipment, S14F2

Host may select which information to include in the MapData based on the context of the request, e.g. the type of equipment requesting it. In this case, the latest BinCodeMap is returned.

3.3.2.1 Strip Type

Host replies MapData for SubstrateId "1234" to Equipment:

```
S14,F2 GetAttr Data (GAD) M,H->E
L,2
    L,1
        L,2
            <OBJID = '1234'>
            L,1
                L,2
                <ATTRID = 'MapData' >
                <ATTRDATA ='
                    <?xml version="1.0" encoding="utf-8"?>
                    <MapData xmlns="urn:semi-org:xsd.E142-1.V1005.SubstrateMap">
                        <Layouts>
                            <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm" >
                                <Dimension X="1" Y="1"/>
                                <ChildLayouts>
                                    <ChildLayout LayoutId="UnitLayout"/>
                                </ChildLayouts>
                            </Layout>
                            <Layout LayoutId="UnitLayout" DefaultUnits="mm"   >
                                <Dimension X="5" Y="3"/>
                            </Layout>
```

```xml
        </Layouts>
        <Substrates>
            <Substrate SubstrateType="Strip" SubstrateId="1234"/>
        </Substrates>
        <SubstrateMaps>
            <SubstrateMap SubstrateType="Strip" SubstrateId="1234" LayoutSpecifier="SubstrateLayout/UnitLayout"
            Orientation="0" OriginLocation="UpperLeft" AxisDirection="DownRight">
                <Overlay MapName="PanelMap" MapVersion="1">
                    <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                        <BinDefinitions>
                            <BinDefinition BinCode="0000" BinCount="12" BinQuality="Good" BinDescription="Tested
                            Ok" Pick="true"/>
                            <BinDefinition BinCode="5000" BinCount="2" BinQuality="Bad" BinDescription="Tested
                            Failed" Pick="false"/>
                        </BinDefinitions>
                        <BinCode>FFFF0000000000000000</BinCode>
                        <BinCode>00000000500000000000</BinCode>
                        <BinCode>50000000000000000000</BinCode>
                    </BinCodeMap>
                </Overlay>
            </SubstrateMap>
        </SubstrateMaps>
    </MapData>
    ' >
L,2
    <OBJACK = 0>
    L,0
```

Figure 4: Host Replies Map Data (Strip Type)

Items in RED are mandatory

NULL	GOOD	GOOD	GOOD	GOOD
GOOD	GOOD	BAD	GOOD	GOOD
BAD	GOOD	GOOD	GOOD	GOOD

Figure 5: MapData for Panel "1234" Based on Example S14F2

3.3.2.2 Wafer Type

Host replies MapData for SubstrateID "Wafer1" to Equipment:

```
S14,F2 GetAttr Data(GAD), M,H->E
L,2
    L,1
        L,2
            <OBJID = 'Wafer1>
            L,1
                L,2
                <ATTRID = 'MapData' >
                <ATTRDATA ='
                    <?xml version="1.0" encoding="utf-8" ?>
                    <MapData xmlns="urn:semi-org:xsd.E142-1.V0805.SubstrateMap">
                        <Layouts>
                            <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm" >
                                <Dimension X="1" Y="1"/>
                                <ChildLayouts>
                                    <ChildLayout LayoutId="UnitLayout"/>
```

```xml
                    </ChildLayouts>
                </Layout>
                <Layout LayoutId="UnitLayout" DefaultUnits="mm">
                    <Dimension X="8" Y="7"/>
                </Layout>
                    </Layouts>
    <Substrates>
        <Substrate SubstrateType="Wafer" SubstrateId="Wafer1"/>
    </Substrates>
    <SubstrateMaps>
    <SubstrateMap SubstrateType="Wafer" SubstrateId="Wafer1" LayoutSpecifier="SubstrateLayout/UnitLayout"
    Orientation="0" OriginLocation="UpperLeft" SubstrateSide="TopSide" AxisDirection="DownRight">
        <Overlay MapName="WaferMap" MapVersion="1">
            <ReferenceDevices>
                <ReferenceDevice Name="FirstDevice" >
                    <Coordinates X="3" Y="2" />
                </ReferenceDevice>
                <ReferenceDevice Name="SecondDevice" >
                    <Coordinates X="6" Y="2" />
                </ReferenceDevice>
                <ReferenceDevice Name="ThirdDevice" >
                    <Coordinates X="2" Y="6" />
                </ReferenceDevice>
            </ReferenceDevices>
            <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                <BinDefinitions>
                    <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok"
```

<ReferenceDevices> is only included in XML when reference point exists.

Pick="true"/>

<BinDefinition BinCode="5000" BinCount="3" BinQuality="Fail" BinDescription="Tested

Failed" Pick="false"/>

</BinDefinitions>

<BinCode>FFFFFFFFFFFF00000000FFFFFFFFFFFF</BinCode>

<BinCode>FFFFFFFF0000000050000000FFFFFFFF</BinCode>

<BinCode>FFFF00005000000000000000000FFFF</BinCode>

<BinCode>FFFF000000000000000000000000FFFF</BinCode>

<BinCode>FFFF000000000000000050000000FFFF</BinCode>

<BinCode>FFFFFFFF0000000000000000FFFFFFFF</BinCode>

</BinCodeMap>

</Overlay>

</SubstrateMap>

</SubstrateMaps>

</MapData>

'>

L,2

<OBJACK = 0>

L,0

*Items in RED are mandatory

Figure 6: Host Replies Map Data (Wafer Type)

NULL	NULL	NULL	PASS	PASS	NULL	NULL	NULL
NULL	NULL	PASS	PASS	FAIL	PASS	NULL	NULL
NULL	PASS	FAIL	PASS	PASS	PASS	PASS	NULL
NULL	PASS	PASS	PASS	PASS	PASS	PASS	NULL
NULL	PASS	PASS	PASS	PASS	FAIL	PASS	NULL
NULL	PASS	PASS	PASS	PASS	PASS	PASS	NULL
NULL	NULL	PASS	PASS	PASS	PASS	NULL	NULL

Figure 7: MapData for Wafer "Wafer1" Based on S14F2 Example

Upon receiving MapData from host (S14F2), equipment must perform validation on below items:

Any validation error must be communicated to host by S5F1 alarm report.

ALID must be filled by equipment vendor

ELEMENT	DESCRIPTION	ALTX	ALID
<Layout> <Dimension>	Must be provided by host and equipment must make sure the dimension is correct	Dimension mismatch Dimension not exist	
<Substrate><SubstrateId>	SubstrateId must be match with requested earlier (S14F1)	SubstrateId mismatch SubstrateId not exist	
<Substrate><SubstrateType>	SubstrateType must be match with requested earlier (S14F1)	SubstrateType mismatch SubstrateType not exist	
<BinDefinition><BinCode>	*<BinDefinition>* must contain *<BinCode>* element	Missing BinCode definition	
<BinCodeMap><BinCode>	*<BinCodeMap >* must contain *<BinCode>* element	Missing BinCode in BinCodeMap	
<BinDefinition><Pick>	*<BinDefinition>* must contain *<Pick> element.* Must have at least 2 *<Pick>* elements, one is 'true' and other one is 'false'. Equipment will only processed BinCode with *<Pick>* = true	Missing Pick element Must have at least 2 pick element value	

Table 8: MapData Validation by Equipment

3.3.3   Equipment Upload MapData, S6F11 W

This service uses the SEMI E30 GEM Event Reporting. The event report setup (i.e. allocation of CEID, RPTID, VID and the linkage between them) may be pre-defined for the equipment or configured dynamically. Equipment will upload MapData upon substrate processing completed and aborted. The MapData upload report will be linked to a substrate processing event such as substrate processing complete and aborted.

Upload MapData event reporting must be send with wait bit means equipment will expect S6F12 reply from Host to ensure MapData is received by Host. If there is no reply from Host (ex. server down), refer to 3.4: Failure Handling.

3.3.3.1 Strip Type

Equipment upload MapData for panel "1234" upon panel processing completed:

```
S6,F11 Event Report M, H<-E

L,3

        <DATAID>

        <CEID> Panel processing complete event identifier

        L,1

                L,2

                        <RPTID> 'Panel completed' map report identifier

                        L,1

                                <'

                                        <?xml version="1.0" encoding="utf-8" ?>

                                        <MapData xmlns="urn:semi-org:xsd.E142-1.V0805.SubstrateMap">

                                                <Layouts>

                                                        <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm" >

                                                                <Dimension X="1" Y="1"/>

                                                                <ChildLayouts>

                                                                        <ChildLayout LayoutId="UnitLayout"/>

                                                                </ChildLayouts>

                                                        </Layout>

                                                        <Layout LayoutId="UnitLayout" DefaultUnits="mm">

                                                                <Dimension X="5" Y="3"/>

                                                        </Layout>

                                                </Layouts>

                                                <Substrates>

                                                        <Substrate SubstrateType="Strip" SubstrateId="1234"/>

                                                </Substrates>
```

```xml
<SubstrateMaps>
    <SubstrateMap SubstrateType="Strip" SubstrateId="1234" LayoutSpecifier="SubstrateLayout/UnitLayout" Orientation="0"
    OriginLocation="UpperLeft" SubstrateSide="TopSide" AxisDirection="DownRight">
        <Overlay MapName="PanelMap" MapVersion="1">
            <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                <BinDefinitions>
                    <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok"/>
                    <BinDefinition BinCode="5000" BinCount="2" BinQuality="Fail" BinDescription="Tested Failed"/>
                    <BinDefinition BinCode="AAAA" BinCount="3" BinQuality="Unknown"
                    BinDescription="NotProcessed"/>
                </BinDefinitions>
                <BinCode>AAAA0000000000005000</BinCode>
                <BinCode>00000000AAAA00000000</BinCode>
                <BinCode>AAAA0000000000005000</BinCode>
            </BinCodeMap>
        </Overlay>
    </SubstrateMap>
</SubstrateMaps>
</MapData>
>
```

*Items in RED are mandatory

Figure 8: Equipment Upload Map Data (Strip Type)

UNK	PASS	PASS	PASS	FAIL
PASS	PASS	UNK	PASS	PASS
UNK	PASS	PASS	PASS	FAIL

Figure 9: MapData for Panel "1234"

3.3.3.2 Wafer Type

Equipment upload MapData for wafer "Wafer1" upon wafer unloaded from the equipment: First 2 rows were processed by equipment.

```
S6,F11 Event Report M, H<-E
L,3
    <DATAID>
    <CEID> Wafer processing complete event identifier
    L,1
        L,2
            <RPTID> 'Wafer completed' map report identifier
            L,1
                <'
                    <?xml version="1.0" encoding="utf-8" ?>
                    <MapData xmlns="urn:semi-org:xsd.E142-1.V0805.SubstrateMap">
                        <Layouts>
                            <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm" >
                                <Dimension X="1" Y="1"/>
                                <ChildLayouts>
                                    <ChildLayout LayoutId="UnitLayout"/>
                                </ChildLayouts>
                            </Layout>
                            <Layout LayoutId="UnitLayout" DefaultUnits="mm">
                                <Dimension X="8" Y="7"/>
                            </Layout>
                        </Layouts>
                    <Substrates>
                        <Substrate SubstrateType="Wafer" SubstrateId="Wafer1"/>
                    </Substrates>
```

```xml
<SubstrateMaps>
    <SubstrateMap SubstrateType="Wafer" SubstrateId="Wafer1" LayoutSpecifier="SubstrateLayout/UnitLayout" Orientation="0"
    OriginLocation="UpperLeft" SubstrateSide="TopSide" AxisDirection="DownRight">
        <Overlay MapName="WaferMap" MapVersion="1">
            <ReferenceDevices>
                <ReferenceDevice Name="FirstDevice" >
                    <Coordinates X="3" Y="2" />
                </ReferenceDevice>
                <ReferenceDevice Name="SecondDevice" >
                    <Coordinates X="6" Y="2" />
                </ReferenceDevice>
                <ReferenceDevice Name="ThirdDevice" >
                    <Coordinates X="2" Y="6" />
                </ReferenceDevice>
            </ReferenceDevices>
            <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                <BinDefinitions>
                    <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok"/>
                    <BinDefinition BinCode="5000" BinCount="2" BinQuality="Fail" BinDescription="Tested Failed"/>
                    <BinDefinition BinCode="AAAA" BinCount="1" BinQuality="Unknown" BinDescription="NotProcessed"/>
                </BinDefinitions>
                <BinCode>FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF</BinCode>
                <BinCode>FFFFFFFFFFFFFFFFAAAAFFFFFFFFFFFF</BinCode>
                <BinCode>FFFF00005000000000000000000FFFF</BinCode>
                <BinCode>FFFF000000000000000000000000FFFF</BinCode>
                <BinCode>FFFF00000000000000050000000FFFF</BinCode>
                <BinCode>FFFFFFFF0000000000000000FFFFFFFF</BinCode>
```

<ReferenceDevices> are only included in XML when reference point was captured

*Items in RED are mandatory

```
                                        </BinCodeMap>
                                </Overlay>
                        </SubstrateMap>
                </SubstrateMaps>
        </MapData>
>
```

Figure 10: Equipment Upload Map Data (Wafer Type)

NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
NULL	NULL	NULL	NULL	UNK	NULL	NULL	NULL
NULL	PASS	FAIL	PASS	PASS	PASS	PASS	NULL
NULL	PASS	PASS	PASS	PASS	PASS	PASS	NULL
NULL	PASS	PASS	PASS	PASS	FAIL	PASS	NULL
NULL	PASS	PASS	PASS	PASS	PASS	PASS	NULL
NULL	NULL	PASS	PASS	PASS	PASS	NULL	NULL

Figure 11: MapData for Wafer "Wafer1"

Parameter Name	Required	Data Item	SECS II type and Range
-	Y	CEID	20, 3(), 5(). Identifer of upload event
-	Y	RPTID	20, 3(), 5(). Identifier of MapData report
-	Y	VID	20, 3(), 5(). Identifier of MapData variable
MapData	Y	V	10. All matching data formatted in XML according to the SEMI E142 OSRAM XML Schema.

Table 9: Map Upload Service Parameter Mapping Table

ELEMENT	DESCRIPTION
<Layout> <LayoutId>	To identify layout Id
<Layout><Dimension>	To indicate total number of units in a substrate
<Substrate><SubstrateId>	Identifier of SubstrateId
<SubstrateMap><SubstrateId>	Identifier of SubstrateId
<SubstrateMap><Orientation>	To indicate orientation of the Substrate MapData
<SubstrateMap><OriginLocation>	**ALWAYS** "UpperLeft" for all Substrate type.
<SubstrateMap><SubstrateSide>	Indication whether Substrate "TopSide" or "BottomSide"
<SubstrateMap><AxisDirection>	**ALWAYS** "DownRight" for all Substrate type.
<Overlay><MapName>	Name of the MapData
<Overlay><MapVersion>	Indication version of the Map. Equipment will retain Map Version number provided by Host.
< ReferenceDevice> *< Coordinates>*	To indicate reference point of wafer map
<BinCodeMap><BinType>	Type of BinCode. **ALWAYS** return type as ***"Interger2"*** to support 4 digits HEX value.
<BinCodeMap><NullBin>	Bin for empty unit
<BinCodeMap><MapType>	Type of MapData
<BinDefinition><BinCode>	BinCode
<BinDefinition><BinCount>	Quantity of BinCode
<BinDefinition><BinQuality>	Indication whether "PASS", "FAIL" or "UNKNOWN"
<BinDefinition><BinDescription>	Additional info on BinCode
<BinCodeMap><BinCode>	MapData

Table 10: Mandatory Elements upon Equipment Upload Map Data

3.4 Failure Handling

Equipment must preserve the processed map if the uploading of MapData failed due to network down or no reply from host server. The equipment must post the information to host when communication resumes, even when spooling is disabled.

When communication resumes and if host query S14F1, equipment should reply with the MapData.

4 SPECIAL FEATURE

4.1 SubstrateId Reader

Reading of SubstrateId can be enable/disable with correct authority on the equipment PC.

4.2 Substrate Origin Location

OriginLocation for all Substrate will be UpperLeft.

4.3 Substrate Map Coordinate System - Row and Column

There is an absolute meaning when we talk about row X and column Y. This is counted as below, when you hold a strip, from top side (where chip will be mounted) and processing direction is to your right, then

- Origin is defined at the upper-left corner with orientation of 0°
- AxisDirection is defined as DownRight.
- Row 0 and column 0 starts from the upper-left corner and count positively to each direction respectively
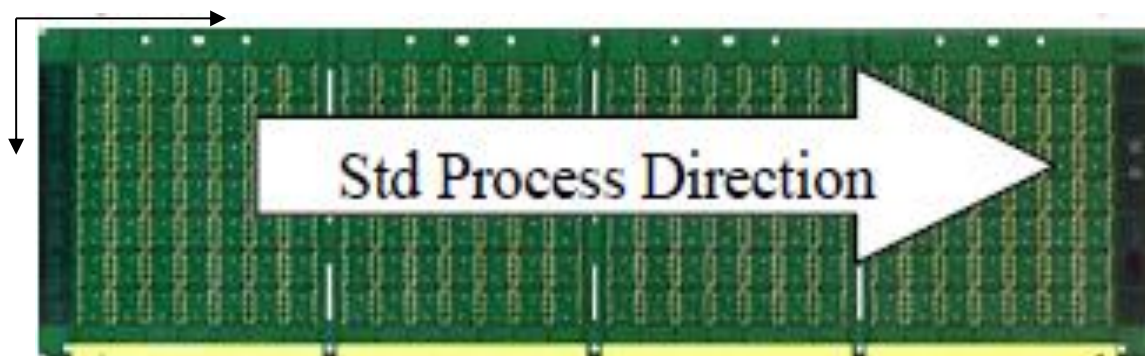
See **Figure 12** below for better understanding:

Figure 12: Substrate Origin Location (Strip Type)

Note, this is just a concept for absolute row and column, it's not meant to re-define or conflict to SEMI coordination systems.

4.4   Orientation of Substrate (Strip)

Sample for dimension of Substrate will be based on 4 columns (X-axis) with 3-rows (Y-axis).

0,0	1,0	2,0	3,0
0,1	1,1	2,1	3,1
0,2	1,2	2,2	3,2

0°

3,0	3,1	3,2
2,0	2,1	2,2
1,0	1,1	1,2
0,0	0,1	0,2

270°

0,2	0,1	0,0
1,2	1,1	1,0
2,2	2,1	2,0
3,2	3,1	3,0

90°

180°

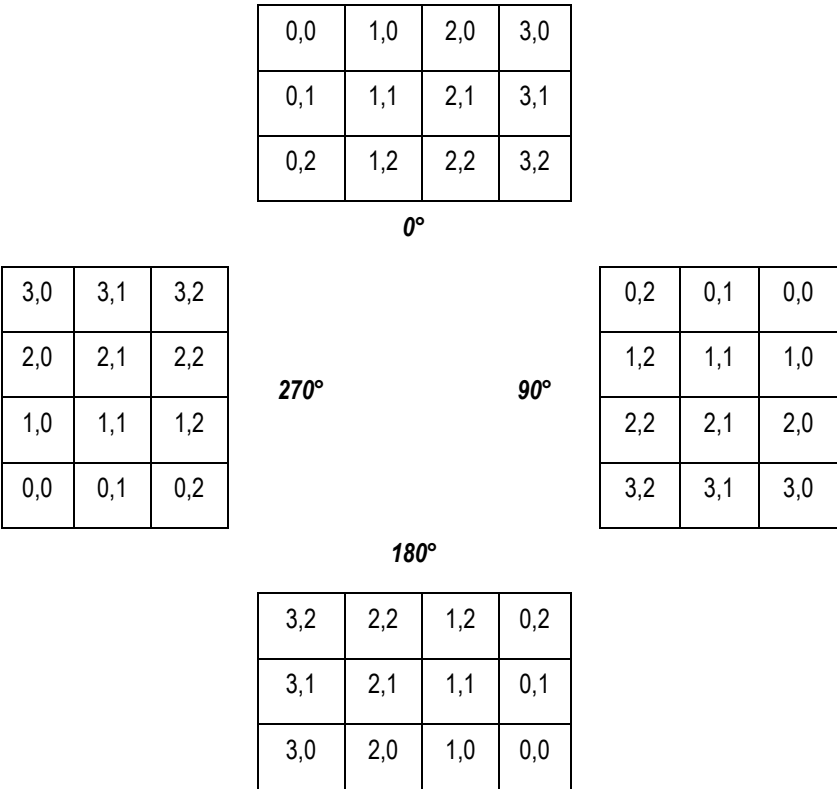| 3,2	2,2	1,2	0,2
3,1	2,1	1,1	0,1
3,0	2,0	1,0	0,0

Figure 13: Substrate Orientation (Strip Type)

4.5   Wafer Map Origin Location

Same as substrate map, origin Location for all Wafer will be UpperLeft.
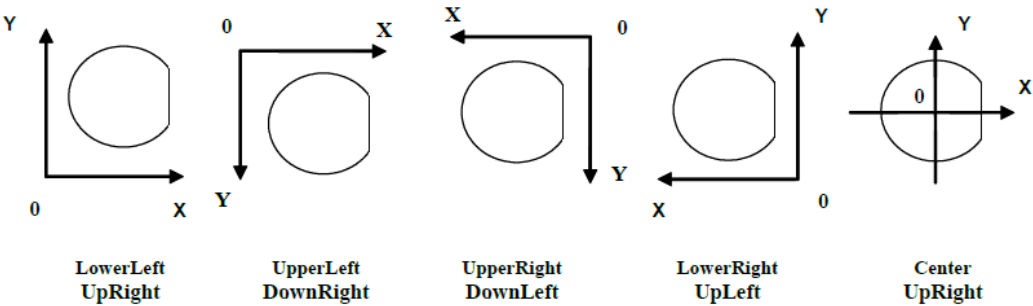
Wafer Coordinate to Address Devices (OriginLocation)

Figure 14: Substrate Origin Location (Wafer Type)

4.6   Wafer Map Coordinate System - Row and Column

- Wafer Origin is defined at the upper-left corner with orientation of 0°.

- AxisDirection is defined as DownRight.

- Row 0 and column 0 starts from the upper-left corner and count positively to each direction respectively

Figure 15: Wafer Map Coordinate System

4.7   Orientation of Substrate (Wafer)

- Sample of wafer map orientation without frame:

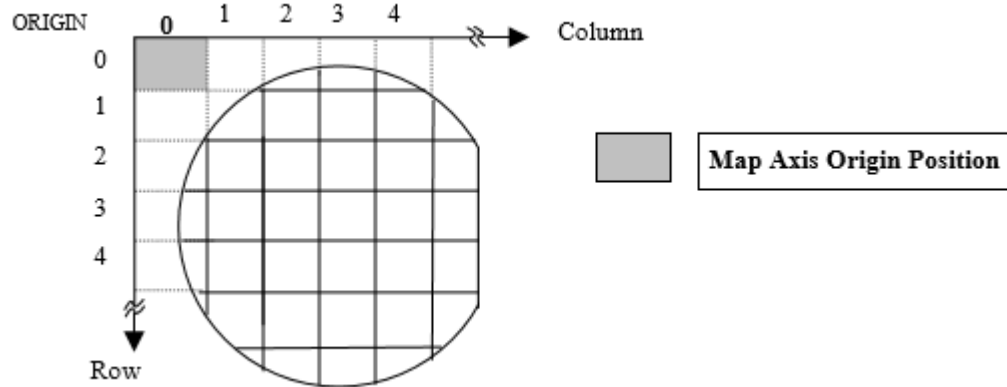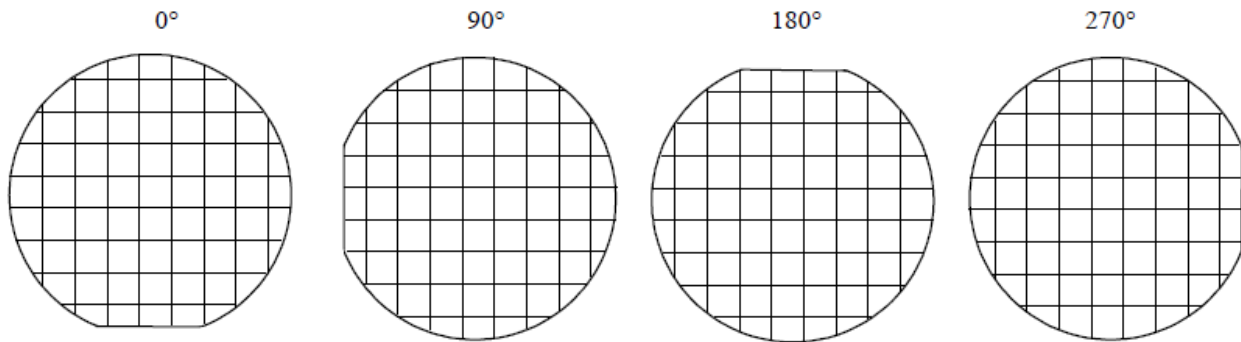**Orientation of the Wafer Flat or Notch (Orientation)**

Figure 16: Orientation of Wafer without Frame

- Sample of wafer map orientation with frame
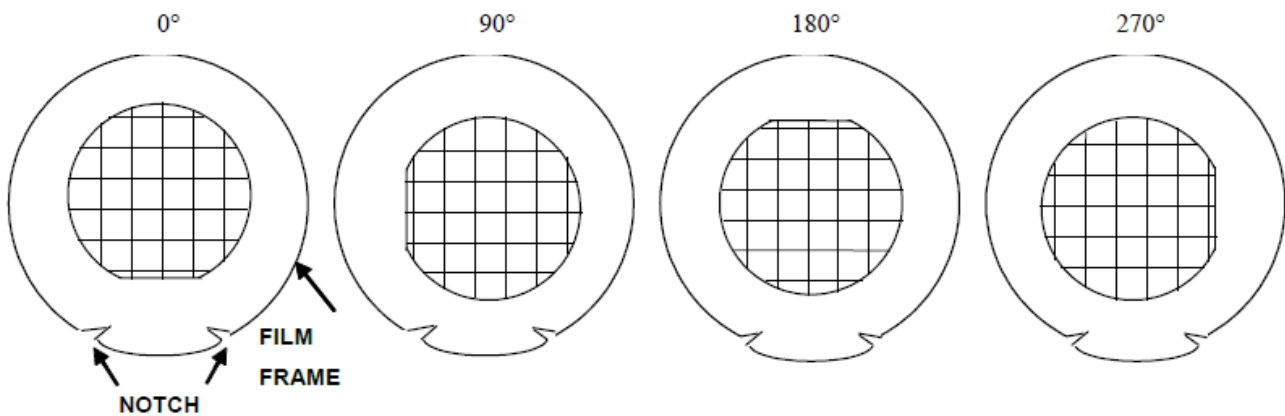
Orientation of the Wafer Flat or Notch on the Film Frame

Figure 17: Orientation of Wafer with Frame

4.8   Non SECS/GEM Compliant Equipment (Strictly for ams OSRAM Use Only)

For non SECS/GEM compliant equipment, MapData will be created in flat file using XML format following the standard of this OSRAM E142 Specification XML format. Host and equipment shall interact using flat file creation in shared folder.

4.8.1   Flat File Naming Convention

Equipment Request Map (Get Attribute Request):

Filename format = GAR_<LotID>_<SubstrateId>_<YYYYMMDDHHMMSS>.xml

35

Host Reply Map (Get Attribute Data):

Filename format = GAD_<LotID>_<SubstrateId>_<YYYYMMDDHHMMSS>.xml

Equipment Update Map (Event Report send):

Filename format = ERS_<LotID>_<SubstrateId>_<YYYYMMDDHHMMSS>.xml

Host Acknowledge Map Update (Event Report Acknowledge):

Filename format = ERA_<LotID>_<SubstrateId>_<YYYYMMDDHHMMSS>.xml

4.8.2 Example of Standard Scenario for Non SECS/GEM Equipment

HOST	SHARED FOLDER	EQUIPMENT
		The Equipment scans SubstrateId. **[IF]** Equipment able to read SubstrateId **[THEN]** The equipment request substrate map from host via flat file. **[ELSE..IF]** Equipment failed to read SubstrateId **[THEN]** Equipment popup substrate manual entry for operator to key in SubstrateId
	GAR_H12345_1234_20140616104132.xml	After identifying SubstrateId, equipment shall request substrate map from host (Get Attribute Request).
[IF] MapData is valid **[THEN]** Host replies MapData request with a flat file creation in shared folder.		

36

ams OSRAM Substrate Mapping & Validation Functional Specification

[ELSE] Host creates MapData flat file reply contain ObjAck=1 and equipment should not process the substrate.		
Host reply MapData (Get Attribute Data).	ObjAck = 0 GAD_H12345_1234_20140616104151.xml ObjAck = 1 GAD_H12345_1234_20140616104153.xml	
		[IF] ObjAck=0 and equipment accepted attributes **[THEN]** Equipment start processing the substrate **[ELSE..IF]** ObjAck=0 and equipment rejected attributes **[THEN]** Equipment prompts alarm and pause substrate processing. Wait for operator judgment. **[ELSE]** Equipment prompts alarm and pause substrate processing. Wait for operator judgment.
	ERS_H12345_1234_20140616104544.xml	Equipment updates MapData after substrate processing completed (Event Report Send).
Host Acknowledge Map Update (Event Report Acknowledge)	ERA_H12345_1234_20140616104545.xml	

Table 11: Standard Scenario for Non SECS/GEM Equipment

GAR_H12345_1234_20140616104132.xml

<?xml version="1.0" encoding="utf-8"?>

<GetAttrRequest OBJSPEC = "" OBJTYPE = "Substrate">

<OBJID>

    <OBJID>1234</OBJID>

</OBJID>

<ATTRID>

    <ATTRID ATTRID="SubstrateType" ATTRDATA="Strip" ATTRRELN="0"/>

</ATTRID>

<ATTRDATA>

    <ATTRID>MapData</ATTRID>

</ATTRDATA>

</GetAttrRequest>

GAD_H12345_1234_20140616104151.xml

<?xml version="1.0" encoding="utf-8"?>

<GetAttrData>

<OBJECTS>

    <OBJECT OBJID ="1234">

        <ATTRIBUTES ATTRID="MapData">

            <ATTRDATA>

                <MapData xmlns="urn:semi-org:xsd.E142-1.V1005.SubstrateMap">

                    <Layouts>

                        <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm">

                            <Dimension X="1" Y="1"/>

                            <ChildLayouts>

```xml
                        <ChildLayout LayoutId="UnitLayout"/>
                    </ChildLayouts>
                </Layout>
                <Layout LayoutId="UnitLayout" DefaultUnits="mm">
                    <Dimension X="5" Y="3"/>
                </Layout>
            </Layouts>
            <Substrates>
                <Substrate SubstrateType="Strip" SubstrateId="1234"/>
            </Substrates>
            <SubstrateMaps>
                <SubstrateMap SubstrateType="Strip" SubstrateId="1234" LayoutSpecifier="SubstrateLayout/UnitLayout" Orientation="0" OriginLocation="UpperLeft"
AxisDirection="DownRight">
                    <Overlay MapName="PanelMap" MapVersion="1">
                        <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                            <BinDefinitions>
                                <BinDefinition BinCode="0000" BinCount="12" BinQuality="Good" BinDescription="Tested Ok" Pick="true"/>
                                <BinDefinition BinCode="5000" BinCount="2" BinQuality="Bad" BinDescription="Tested Failed" Pick="false"/>
                            </BinDefinitions>
                            <BinCode>FFFF0000000000000000</BinCode>
                            <BinCode>0000000050000000000</BinCode>
                            <BinCode>5000000000000000000</BinCode>
                        </BinCodeMap>
                    </Overlay>
                </SubstrateMap>
            </SubstrateMaps>
        </MapData>
```

```
            </ATTRDATA>
        </ATTRIBUTES>
    </OBJECT>
</OBJECTS>
<OBJACK OBJACK = "0">
    <ERRORS>
        <ERROR ERRCODE = "" ERRTEXT = ""/>
    </ERRORS>
</OBJACK>
</GetAttrData>
```

```
GAD_H12345_1234_20140616104153.xml
<?xml version="1.0" encoding="utf-8"?>
<GetAttrData>
<OBJECTS>
    <OBJECT OBJID ="1234">
        <ATTRIBUTES ATTRID="MapData">
            <ATTRDATA>
                <MapData>
                </MapData>
            </ATTRDATA>
        </ATTRIBUTES>
    </OBJECT>
</OBJECTS>
<OBJACK OBJACK = "1">
    <ERRORS>
        <ERROR ERRCODE = "2" ERRTEXT = "Invalid Lot ID"/>
```

```
            </ERRORS>

        </OBJACK>

    </GetAttrData>
```

```
ERS_H12345_1234_20140616104544.xml

<?xml version="1.0" encoding="utf-8" ?>

<EventReportSend Event = "SubstrateCompleted">

<MapData xmlns="urn:semi-org:xsd.E142-1.V0805.SubstrateMap">

        <Layouts>

                <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm">

                        <Dimension X="1" Y="1"/>

                        <ChildLayouts>

                                <ChildLayout LayoutId="UnitLayout"/>

                        </ChildLayouts>

                </Layout>

                <Layout LayoutId="UnitLayout" DefaultUnits="mm">

                        <Dimension X="5" Y="3"/>

                </Layout>

        </Layouts>

        <Substrates>

                <Substrate SubstrateType="Strip" SubstrateId="1234"/>

        </Substrates>

        <SubstrateMaps>

                <SubstrateMap SubstrateType="Strip" SubstrateId="1234" layoutSpecifier="SubstrateLayout/UnitLayout" Orientation="0" OriginLocation="UpperLeft"

AxisDirection="DownRight">

                        <Overlay MapName="PanelMap" MapVersion="1">

                                <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
```

```
            <BinDefinitions>
                <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok"/>
                <BinDefinition BinCode="5000" BinCount="2" BinQuality="Fail" BinDescription="Tested Failed"/>
                <BinDefinition BinCode="AAAA" BinCount="3" BinQuality="Unknown" BinDescription="NotProcessed"/>
            </BinDefinitions>
            <BinCode>AAAA000000000000005000</BinCode>
            <BinCode>000000000AAAA000000000</BinCode>
            <BinCode>AAAA000000000000005000</BinCode>
          </BinCodeMap>
        </Overlay>
      </SubstrateMap>
    </SubstrateMaps>
  </MapData>
</EventReportSend>
```

```
ERA_H12345_1234_2014061604545.xml

<?xml version="1.0" encoding="utf-8" ?>

<EventReportAcknowledge ACKC6 = "0"/>
```

Figure 18: XML Example of Standard Scenario for Non SECS/GEM Equipment

5 HARDWARE REQUIREMENTS

5.1 Substrate ID Reader

The equipment must be equipped with a Substrate ID Reader (e.g.: Barcode reader, OCR). This is to facilitate the scenarios described in previous chapters, where the SubstrateId can be read on the physical substrate. Besides, the Substrate ID Reader required to perform Substrate validation as described in Appendix section of this document.

5.2 USB Interface

The equipment must be equipped with USB interface. This is to facilitate the scenarios described in Chapter 3.4: Failure Handling, where the map can be transfer via USB interface if there is an interruption with network connection.

5.3 Network Card

The equipment must be equipped with unoccupied network interface (Ex. 100 Mb / 1 GB speed). This is to facilitate SEMI E37 (HSMS) between equipment and host through ams OSRAM network.

6 CONFIGURABLE PARAMETERS

All configurable parameters must be changeable by Host via SECS/GEM message, as Equipment Constant.

Parameters shown below are **MANDATORY**. They shall be used in Substrate mapping flow and generate Substrate mapping file.

Parameters shown below is a standard bin definition used in ams OSRAM Worldwide.

NULL BinCode	*:*	***FFFF***
UnProcessed BinCode	*:*	***AAAA***

To be provided by Equipment vendor for each BinCode description below together with Equipment E142 specification:

PASS BinCode (0000 – 4999)

NO	BINCODE	DESCRIPTION
1	0000	(PASS BinCode to be defined by Process Engineer)
2	0001	
3	0002	
4	0003	

Table 12: Example of PASS Bin Code

FAIL BinCode (5000 – 9999)

NO	BINCODE	DESCRIPTION
1	5000	(FAIL BinCode to be defined by Process Engineer)
2	5001	
3	5002	
4	5003	

Table 13: Example of FAIL Bin Code

7 Example: E142 Substrate Map Handling

7.1 Attributes

Please refer to SEMI E142 specification and related sub-documents for detailed information and technical explanation of the attributes used in this specification.

7.2 Sample Substrate Map (Strip)

7.2.1 XML Format – (Host ← Equipment)

Figure 19: SubstrateMap Visualization of 4-Columns (X) with 3-Rows (Y) – Single Chip

```xml
<?xml version="1.0" encoding="utf-8"?>
<MapData xmlns="urn:semi-org:xsd.E142-1.V1005.SubstrateMap">
    <Layouts>
        <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm">
        <Dimension X="1" Y="1"/>
        <ChildLayouts>
            <ChildLayout LayoutId="UnitLayout"/>
        </ChildLayouts>
        </Layout>
        <Layout LayoutId="UnitLayout" DefaultUnits="mm">
            <Dimension X="4" Y="3"/>
        </Layout>
```

```xml
        </Layouts>

    <Substrates>

            <Substrate SubstrateType="Strip" SubstrateId="ABC123"/>

    </Substrates>

            <SubstrateMaps>

                <SubstrateMap SubstrateType="Strip" SubstrateId="ABC123" LayoutSpecifier="SubstrateLayout/UnitLayout" SubstrateSide="TopSide" Orientation="0"

                OriginLocation="UpperLeft" AxisDirection="DownRight">

                    <Overlay MapName="Strip" MapVersion="1">

                        <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">

                            <BinDefinitions>

                                <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok"/>

                                <BinDefinition BinCode="5000" BinCount="2" BinQuality="Fail" BinDescription="Tested Failed"/>

                                <BinDefinition BinCode="AAAA" BinCount="0" BinQuality="Unknown" BinDescription="NotProcessed"/>

                            </BinDefinitions>

                            <BinCode> 0000000000000000</BinCode>

                            <BinCode> 0000500000000000</BinCode>

                            <BinCode> 0000000000005000</BinCode>

                        </BinCodeMap>

                    </Overlay>

                </SubstrateMap>

            </SubstrateMaps>

    </MapData>
```

Figure 20: SubstrateMap XML of 4-Columns (X) with 3-Rows (Y) – Single Chip

7.2.2   TransferMap: XML Format – (Host ← Equipment)

Figure 21: TransferMap Visualizition of 4-Columns (X) with 3-Rows (Y) – Single Chip (1 Chip Transferred from 1 Wafer)

```xml
<?xml version="1.0" encoding="utf-8"?>
<MapData xmlns="urn:semi-org:xsd.E142-1.V1005.SubstrateMap">
    <Layouts>
        <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm">
            <Dimension X="1" Y="1"/>
            <ChildLayouts>
                <ChildLayout LayoutId="UnitLayout"/>
            </ChildLayouts>
        </Layout>
        <Layout LayoutId="UnitLayout" DefaultUnits="mm">
            <Dimension X="4" Y="3"/>
        </Layout>
    </Layouts>
    <Substrates>
        <Substrate SubstrateType="Strip" SubstrateId="ABC123"/>
    </Substrates>
    <SubstrateMaps>
        <SubstrateMap SubstrateType="Strip" SubstrateId="ABC123" LayoutSpecifier="SubstrateLayout/UnitLayout" SubstrateSide="TopSide" Orientation="0"
```

```
OriginLocation="UpperLeft" AxisDirection="DownRight">

            <Overlay MapName="Strip" MapVersion="1">

                <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">

                    <BinDefinitions>

                        <BinDefinition BinCode="0000" BinCount="7" BinQuality="Pass" BinDescription="Tested Ok"/>

                        <BinDefinition BinCode="5000" BinCount="4" BinQuality="Fail" BinDescription="Tested Failed"/>

                        <BinDefinition BinCode="AAAA" BinCount="1" BinQuality="Unknown" BinDescription="Not Processed"/>

                    </BinDefinitions>

                    <BinCode> 0000000000000000</BinCode>

                    <BinCode> 0000500000000000</BinCode>

                    <BinCode> 000000000000AAAA</BinCode>

                </BinCodeMap>

            </Overlay>

            <Overlay MapName="Wafer1ToStrip" MapVersion="1">

                <TransferMap FromSubstrateType="Wafer" FromSubstrateId="Wafer1" FromSubstrateLayoutSpecifier="WaferMapExample/DeviceLayout">

                    <T FX="21" FY="22" TX="0" TY="0"/>

                    <T FX="21" FY="23" TX="1" TY="0"/>

                    <T FX="21" FY="24" TX="2" TY="0"/>

                    <T FX="21" FY="25" TX="3" TY="0"/>

                    <T FX="21" FY="26" TX="0" TY="1"/>

                    <T FX="21" FY="27" TX="1" TY="1"/>

                    <T FX="21" FY="28" TX="2" TY="1"/>

                    <T FX="21" FY="29" TX="3" TY="1"/>

                    <T FX="21" FY="30" TX="0" TY="2"/>

                    <T FX="21" FY="31" TX="1" TY="2"/>

                    <T FX="21" FY="32" TX="2" TY="2"/>

                </TransferMap>
```

```
            </Overlay>
          </SubstrateMap>
      </SubstrateMaps>
</MapData>
```

Figure 22: TransferMap XML of 4-Columns (X) with 3-Rows (Y) – Single Chip (1 Chip Transferred from 1 Wafer)

Substrate Map (Source) – Id: ABC123

DeviceId Map (Destination)

AAAA	BBBB	CCCC	DDDD
EEEE	FFFF	GGGG	HHHH
JJJJ	KKKK	LLLL	MMMM

Figure 23: TransferMap Visualization of 4-Columns (X) with 3-Rows (Y) – Single Chip to 1 Unit with DeviceId

```xml
<?xml version="1.0" encoding="utf-8"?>

<MapData xmlns="urn:semi-org:xsd.E142-1.V1005.SubstrateMap">

    <Layouts>

        <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm">

        <Dimension X="1" Y="1"/>

        <ChildLayouts>

            <ChildLayout LayoutId="UnitLayout"/>

        </ChildLayouts>

        </Layout>

        <Layout LayoutId="UnitLayout" DefaultUnits="mm">

            <Dimension X="4" Y="3"/>

        </Layout>

    </Layouts>

    <Substrates>

        <Substrate SubstrateType="Strip" SubstrateId="ABC123"/>

    </Substrates>

    <SubstrateMaps>

        <SubstrateMap SubstrateType="Strip" SubstrateId="ABC123" LayoutSpecifier="SubstrateLayout/UnitLayout" SubstrateSide="TopSide" Orientation="0" OriginLocation="UpperLeft"
        AxisDirection="DownRight">

            <Overlay MapName="Strip" MapVersion="1">

                <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">

                    <BinDefinitions>

                        <BinDefinition BinCode="0000" BinCount="16" BinQuality="Pass" BinDescription="Tested Ok"/>

                        <BinDefinition BinCode="5000" BinCount="6" BinQuality="Fail" BinDescription="Tested Failed"/>
```

```xml
                    <BinDefinition BinCode="AAAA" BinCount="2" BinQuality="Unknown" BinDescription="Not Processed"/>
                </BinDefinitions>
                <BinCode> 0000000000000000</BinCode>
                <BinCode> 0000AAAA00000000</BinCode>
                <BinCode> 000000000000AAAA</BinCode>
            </BinCodeMap>
    </Overlay>
    <Overlay MapName="MCB" MapVersion="1">
        <DeviceIdMap>
                <Id X="0" Y="0">AAAA</Id>
                <Id X="1" Y="0">BBBB</Id>
                <Id X="2" Y="0">CCCC</Id>
                <Id X="3" Y="0">DDDD</Id>
                <Id X="0" Y="1">EEEE</Id>
                <Id X="1" Y="1">FFFF</Id>
                <Id X="2" Y="1">GGGG</Id>
                <Id X="3" Y="1">HHHH</Id>
                <Id X="0" Y="2">JJJJ</Id>
                <Id X="1" Y="2">KKKK</Id>
        </DeviceIdMap>
    </Overlay>
    <Overlay MapName="StriptoDeviceId" MapVersion="1" >
        <TransferMap FromSubstrateType="Strip" FromSubstrateId="ABC123" FromSubstrateLayoutSpecifier=" SubstrateLayout/UnitLayout">
                <T FX="0" FY="0" TX="0" TY="0"/>
                <T FX="1" FY="0" TX="1" TY="0"/>
                <T FX="2" FY="0" TX="2" TY="0"/>
```

```
                    <T FX="3" FY="0" TX="3" TY="0"/>

                    <T FX="0" FY="1" TX="0" TY="1"/>

                    <T FX="2" FY="1" TX="1" TY="1"/>

                    <T FX="3" FY="1" TX="2" TY="1"/>

                    <T FX="0" FY="2" TX="3" TY="1"/>

                    <T FX="1" FY="2" TX="0" TY="2"/>

                    <T FX="2" FY="2" TX="1" TY="2"/>

                </TransferMap>

            </Overlay>

        </SubstrateMap>

    </SubstrateMaps>

</MapData>
```

**Figure 24: TransferMap XML of 4-Columns (X) with 3-Rows (Y) – Single Chip to 1 Unit with DeviceId**

## 7.3 Sample of Substrate Map (Wafer)

### 7.3.1 Download map for wafer (E → H)

```
S14,F1 GetAttr Request (GAR) S,H<-E
L,5
        <OBJSPEC = '' >
        <OBJTYPE = 'Substrate'>
        L,1
               <OBJID = 'Wafer1'>
        L,1
               L,3
                       <ATTRID = 'SubstrateType' >
                       <ATTRDATA = 'Wafer' >
                       <ATTRRELN = 0 >
        L,1
         <ATTRID = "MapData">
```

Figure 25: Sample of Equipment Request of Map Data (Wafer Type)

7.3.2 Map return from Host (H → E)

```
S14,F2 GetAttr Data(GAD), M,H->E
L,2
    L,1
        L,2
            <OBJID = 'Wafer1'>
            L,1
                L,2
                <ATTRID = 'MapData' >
                <ATTRDATA ='
                    <?xml version="1.0" encoding="utf-8" ?>
                    <MapData xmlns="urn:semi-org:xsd.E142-1.V0805.SubstrateMap">
                        <Layouts>
                            <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm" >
                                <Dimension X="1" Y="1"/>
                                <ChildLayouts>
                                    <ChildLayout LayoutId="UnitLayout"/>
                                </ChildLayouts>
                            </Layout>
                            <Layout LayoutId="UnitLayout" DefaultUnits="mm">
                                <Dimension X="8" Y="7"/>
                            </Layout>
                        </Layouts>
                    <Substrates>
                        <Substrate SubstrateType="Wafer" SubstrateId="Wafer1"/>
                    </Substrates>
```
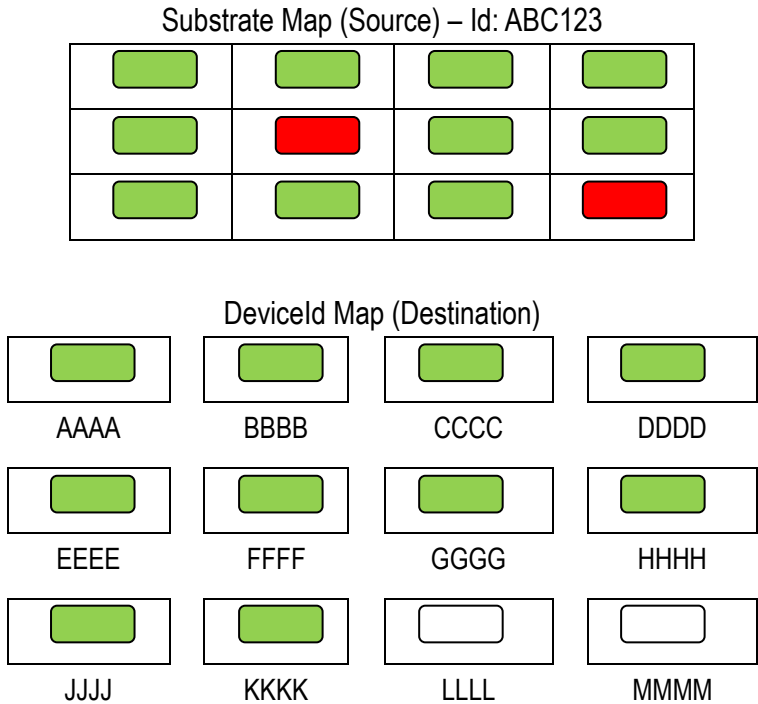
```xml
<SubstrateMaps>
<SubstrateMap SubstrateType="Wafer" SubstrateId="Wafer1" LayoutSpecifier="SubstrateLayout/UnitLayout" Orientation="0" OriginLocation="UpperLeft"
SubstrateSide="TopSide" AxisDirection="DownRight">
    <Overlay MapName="WaferMap" MapVersion="1">
        <ReferenceDevices>
            <ReferenceDevice Name="FirstDevice" >
                <Coordinates X="3" Y="2" />
            </ReferenceDevice>
            <ReferenceDevice Name="SecondDevice" >
                <Coordinates X="6" Y="2" />
            </ReferenceDevice>
            <ReferenceDevice Name="ThirdDevice" >
                <Coordinates X="2" Y="6" />
            </ReferenceDevice>
        </ReferenceDevices>
            <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                <BinDefinitions>
                    <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok" Pick="true"/>
                    <BinDefinition BinCode="5000" BinCount="3" BinQuality="Fail" BinDescription="Tested Failed" Pick="false"/>
                </BinDefinitions>
                <BinCode>FFFFFFFFFFFF00000000FFFFFFFFFFFF</BinCode>
                <BinCode>FFFFFFFF0000000000005000FFFFFFFF</BinCode>
                <BinCode>FFFF00005000000000000000000FFFFF</BinCode>
                <BinCode>FFFF0000000000000500000000FFFFF</BinCode>
                <BinCode>FFFF0000000000000000000000FFFFF</BinCode>
                <BinCode>FFFFFFFF0000000000000000FFFFFFFF</BinCode>
                </BinCodeMap>
```

```
                                                    </Overlay>

                                                  </SubstrateMap>

                                                </SubstrateMaps>

                                              </MapData>

                                                    '>

          L,2

                <OBJACK = 0>

            L,0
```

Figure 26: Sample of Host Provide Map Data to Equipment

```
S6,F11 Event Report M, H<-E

L,3

      <DATAID>

      <CEID> Wafer processing complete event identifier

      L,1

            L,2

                  <RPTID> 'Wafer completed' map report identifier

                  L,1

                        <'

                              <?xml version="1.0" encoding="utf-8" ?>

                              <MapData xmlns="urn:semi-org:xsd.E142-1.V0805.SubstrateMap">

                                    <Layouts>

                                          <Layout LayoutId="SubstrateLayout" TopLevel="true" DefaultUnits="mm" >

                                                <Dimension X="1" Y="1"/>

                                                <ChildLayouts>
```

```xml
                <ChildLayout LayoutId="UnitLayout"/>
            </ChildLayouts>
        </Layout>
        <Layout LayoutId="UnitLayout" DefaultUnits="mm">
            <Dimension X="8" Y="7"/>
        </Layout>
    </Layouts>
<Substrates>
    <Substrate SubstrateType="Wafer" SubstrateId="Wafer1"/>
</Substrates>
<SubstrateMaps>
<SubstrateMap SubstrateType="Wafer" SubstrateId="Wafer1" LayoutSpecifier="SubstrateLayout/UnitLayout" Orientation="0" OriginLocation="UpperLeft"
SubstrateSide="TopSide" AxisDirection="DownRight">
    <Overlay MapName="PanelMap" MapVersion="1">
        <ReferenceDevices>
            <ReferenceDevice Name="FirstDevice" >
                <Coordinates X="2" Y="3" />
            </ReferenceDevice>
            <ReferenceDevice Name="SecondDevice" >
                <Coordinates X="7" Y="3" />
            </ReferenceDevice>
            <ReferenceDevice Name="ThirdDevice" >
                <Coordinates X="2" Y="6" />
            </ReferenceDevice>
        </ReferenceDevices>
            <BinCodeMap BinType="Integer2" NullBin="FFFF" MapType="2DArray">
                <BinDefinitions>
```

<ReferenceDevices> is only included in XML when reference point was recorded.

```xml
                                                            <BinDefinition BinCode="0000" BinCount="10" BinQuality="Pass" BinDescription="Tested Ok"/>

                                                            <BinDefinition BinCode="5000" BinCount="2" BinQuality="Fail" BinDescription="Tested Failed"/>

                                                            <BinDefinition BinCode="AAAA" BinCount="1" BinQuality="Unknown" BinDescription="NotProcessed"/>

                                                            </BinDefinitions>

                                                            <BinCode>FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF</BinCode>

                                                            <BinCode>FFFFFFFFFFFFFFFFFFFFFAAAAFFFFFFFF</BinCode>

                                                            <BinCode>FFFF0000500000000000000000000FFFF</BinCode>

                                                            <BinCode>FFFF000000000000000000000000FFFF</BinCode>

                                                            <BinCode>FFFF00000000000000050000000FFFF</BinCode>

                                                            <BinCode>FFFF0000000000000000000000000FFFF</BinCode>

                                                            <BinCode>FFFFFFFF0000000000000000FFFFFFFF</BinCode>

                                                </BinCodeMap>

                                        </Overlay>

                                </SubstrateMap>

                        </SubstrateMaps>

                </MapData>

        >
```

*Items in RED are mandatory

NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
NULL	NULL	NULL	NULL	NULL	UNK	NULL	NULL
NULL	PASS	FAIL	PASS	PASS	PASS	PASS	NULL
NULL	PASS	PASS	PASS	PASS	PASS	PASS	NULL
NULL	PASS	PASS	PASS	PASS	FAIL	PASS	NULL
NULL	PASS	PASS	PASS	PASS	PASS	PASS	NULL
NULL	NULL	PASS	PASS	PASS	PASS	NULL	NULL

Figure 28: MapData Visualization for Wafer "Wafer1"

8 Device and Substrate Validation

The intention is for equipment software to validate Device ID / Substrate ID used upon lot processing. When this feature is enabled, host will send a SECS message with Device / Substrate information of the lot for equipment for validation purpose. Equipment must have the capability to scan or read the Device ID / Substrate ID (1D & 2D barcode) for this validation to happen.

S14F3 is used instead of S14F1 because:

1. Information is initiate by host instead of requested by equipment
2. To handle bulk device processing (Singulated form device without substrate)

8.1 Set Device Info

This will be the standard stream function for host to provide device information to equipment using S14F3. See sample message below:

```
Stream:14 Function:3 Primary Wait:1 Name:SAR_3
Data:
  <L [4,1]
    <A [0,1] > *[OBJSPEC] Specific object instance
    <A [3,2] 'Device' > *[OBJTYPE] Identifier for group or class of objects
    <L [1,3]
      <A [8,1] 'HL634001'> *[OBJID] Identifier for an object
    >
    <L [9,4]
      <L [2,1]
        <A [8,1] 'DeviceID'> *[ATTRID: SetAttribute-DEVICEID] ATTRID
        <A [43,2] '5000533698,5000533699,5000533700,5000533701'> *[ATTRDATA: SetAttribute-DEVICEID] ATTRDATA
      >
      <L [2,2]
        <A [9,1] 'AliasID'> *[ATTRID: SetAttribute-ALIASID] ATTRID
        <A [39,2] 'RHCDJ0712,RHCDJ0711,RHCDJ0713,RHCDJ0714'> *[ATTRDATA: SetAttribute-ALIASID] ATTRDATA
      >
      <L [2,3]
        <A [8,1] 'SubstrateID'> *[ATTRID: SetAttribute-SUBSTRATEID] ATTRID
        <A [39,2] 'SPC001715,SPC001716,SPC001717,SPC001718'> *[ATTRDATA: SetAttribute-SUBSTRATEID] ATTRDATA
      >
      <L [2,4]
        <A [8,1] 'PositionID'> *[ATTRID: SetAttribute-POSITIONID] ATTRID
        <A [7,2] '1,2,3,4'> *[ATTRDATA: SetAttribute-POSITIONID] ATTRDATA
```

```
        >
        <L [2,5]
            <A [8,1] 'X'> *[ATTRID: SetAttribute-X] ATTRID
            <A [7,2] '1,2,3,4'> *[ATTRDATA: SetAttribute-X] ATTRDATA
        >
        <L [2,6]
            <A [8,1] 'Y'> *[ATTRID: SetAttribute-Y] ATTRID
            <A [7,2] '1,2,3,4'> *[ATTRDATA: SetAttribute-Y] ATTRDATA
        >
        <L [2,7]
            <A [8,1] 'Bincode'> *[ATTRID: SetAttribute-BINCODE] ATTRID
            <A [19,2] '5006,5002,0000,0001'> *[ATTRDATA: SetAttribute-BINCODE] ATTRDATA
        >
        <L [2,8]
            <A [8,1] 'Pick'> *[ATTRID: SetAttribute-PICK] ATTRID
            <A [7,2] '0,1,0,1'> *[ATTRDATA: SetAttribute-PICK] ATTRDATA
        >
        <L [2,9]
            <A [8,1] 'BinDesc'> *[ATTRID: SetAttribute-SAPBARCODE] ATTRID
            <A [39,2] 'AB-3-3B, AB-3-4B, AB-3-5B, AB-3-6B'> *[ATTRDATA: SetAttribute-SAPBARCODE] ATTRDATA
        >
    >
>
```

Figure 29: Sample Device Information to Equipment

a. For providing device info:

   OBJTYPE = "Device"

   OBJID = Lot Number

b. Attributes for this SECS message is specified in below table. Data with asterisk (*) are mandatory and cannot be of empty value.

Device Info Attributes	Remarks
DeviceId*	Device Identification
AliasId	Device Alias Identification
SubstrateId	Substrate ID where the device is located
PositionId	Position where the device is located on top of the substrate
X	X coordinate of the device on top of the substrate
Y	Y coordinate of the device on top of the substrate
BinCode*	Bin number of the device
Pick*	Pick indicator for processing
BinDesc*	Bin description of the device

Table 14: Device Info Attributes

c. The number of attributes in the message is depending on the data availability from the host.

d. This feature needs to be controlled via Equipment Constant. If Equipment Constant is disabled, equipment should accept empty attribute list (Host does not have device information). If Equipment Constant is enabled and host sends empty list, then equipment should reject the message.

e. Status of the reply depend on the OBJACK from S14F4 (Refer to SEMI-E05).

f. Equipment should accept additional S14F3 from host during processing.

8.2   Set Substrate Info

This will be the standard stream function for host to provide substrate information to equipment using S14F3. See sample message below:

```
14:03:42.76 Sending S14F3 WaitBit:1 Header: 00 00 00 00 00 00 00 00 00 00

 Data:
 <L [4,1]
   <A [0,1] > *[OBJSPEC] Specific object instance
   <A [8,2] 'Substrate'> *[OBJTYPE] Identifier for group or class of objects
   <L [1,3]
     <A [8,1] 'HL02300X'> *[OBJID] Identifier for an object
   >
   <L [3,4]
     <L [2,1]
       <A [12,1] 'WaferType1'>
       <A [44,2] 'A6733240,A5701939,A6307167,A6288447,A5500643'>
     >
     <L [2,2]
       <A [12,1] 'WaferType2'>
       <A [44,2] 'A5799861,A5743285,A5500398,A5506874,A5506876'
 >
```

```
<L [2,3]

        <A [9,1] 'Substrate'>

        <A [20,2] '0DCCZD,0DCCZB,0DCCZW'>

    >

  >

>
```

Figure 30: Sample Set Substrate Info to Equipment

a. For providing substrate info:

   OBJTYPE = "Substrate"

   OBJID = Lot Number

b. This feature needs to be controlled via Equipment Constant. If Equipment Constant is disabled, equipment should accept empty attribute list (Host does not have device information). If Equipment Constant is enabled and host sends empty list, then equipment should reject the message.

c. Status of the reply depend on the OBJACK from S14F4 (Refer to SEMI-E05).

d. Equipment should accept additional S14F3 from host during processing.

8.3   Update Device Info

Equipment should send Device Info Update event using S6F11 to host to update the device information after it has been processed. Depending on the way the device is being processed, the update to host can be provided in two ways:

8.3.1   Individual Device Processing

This is applicable for equipment that is processing one single device at a time. Device Processed event (S6F11) must be sent after each device is processed immediately. Every device info needs to be provided as variables that can be linked to report dynamically by host. See sample message below:

```
10:15:03.97 Sending S6F11 WaitBit:1 Header: 00 00 86 0B 80 01 00 00 00 04

 Data:

<L [3,1]

   <U4 [1,1] 0> *[DATAID] Data ID

   <U4 [1,2] 350> *[CEID] Collection event ID to be defined by equipment supplier

   <L [1,3]

     <L [2,1]

       <U4 [1,1] 1005> *[RPTID] Report ID

       <L [10,2]

    <A [3,1] '5000533699'>    *[V] Variable data DeviceId

    <A [1,2] 'RHCDJ0711'>    *[V] Variable data AliasId
```

```
        <A [2,4] 'SPC001716'>      *[V] Variable data SourceSubstrateId

        <A [4,5] 'SPC001717'>      *[V] Variable data TargetSubstrateId

        <A [1,6] '1'>    *[V] Variable data SourcePositionId

        <A [4,7] '2'>    *[V] Variable data TargetPositionId

        <A [3,8] '1'>    *[V] Variable data FromX

        <A [1,9] '2'>    *[V] Variable data FromY

        <A [2,10] '1'> *[V] Variable data ToX

        <A [4,11] '1'> *[V] Variable data ToY

        <A [1,12] 'Pass'> *[V] Variable data Quality

        <A [4,13] '5006'>    *[V] Variable data Bincode

        <A [1,15] 'AB-3-3B'>    *[V] Variable data BinDesc

          >

        >

      >

    >
```

Figure 31: Sample Individual Device Processing

8.3.2   Batch Device Processing

This is applicable for equipment that is processing multiple device at a time. Device Processed event (S6F11) must be sent after each batch is processed. Every device info in the batch needs to be provided as a list type variable that can be linked to report dynamically by host. The sequence of device info within a list is required to be fixed. See sample message below:

```
<L [3,1]
      <U4 [1,1] 2912>
      <U4 [1,2] 6008> (Event ID, to be define by equipment supplier)
<L [1,3]
<L [2,1]
      <U4 [1,1] 6007>
<L [1,2]
<L [3,1] (DV)
<L [14,1]
      <A [3,1] '5000533699'>    *DeviceId
      <A [1,2] 'RHCDJ0711'>    *AliasId
      <A [2,4] 'SPC001716'>     *SourceSubstrateId
      <A [4,5] 'SPC001717'>     *TargetSubstrateId
```

```
        <A [1,6] '1'>    *SourcePositionId

        <A [4,7] '2'>    *TargetPositionId

        <A [3,8] '1'>    *FromX

        <A [1,9] '2'>    *FromY

        <A [2,10] '1'> *ToX

        <A [4,11] '1'> *ToY

        <A [1,12] 'Pass'> *Quality

        <A [4,13] '5006'>    *Bincode

        <A [1,15] 'AB-3-3B'>    *BinDesc

>

<L [14,1]

        <A [3,1] '5000533698'>

        <A [1,2] 'RHCDJ0712'>

        <A [2,4] 'SPC001716'>

        <A [4,5] 'SPC001717'>

        <A [1,6] '2'>

        <A [4,7] '3'>

        <A [3,8] '2'>

        <A [1,9] '3'>

        <A [2,10] '1'>

        <A [4,11] '1'>

        <A [1,12] 'Pass'>

        <A [4,13] '5006'>

        <A [1,15] 'AB-3-3C'>

>

<L [14,1]

        <A [3,1] '5000533697'>

        <A [1,2] 'RHCDJ0713'>

        <A [2,4] 'SPC001716'>

        <A [4,5] 'SPC001717'>

        <A [1,6] '3'>

        <A [4,7] '4'>

        <A [3,8] '3'>

        <A [1,9] '4'>

        <A [2,10] '1'>

        <A [4,11] '1'>

        <A [1,12] 'Pass'>

        <A [4,13] '5006'>
```

```
<A [1,15] 'AB-3-3D'>

                       >
                  >
            >
      >
```
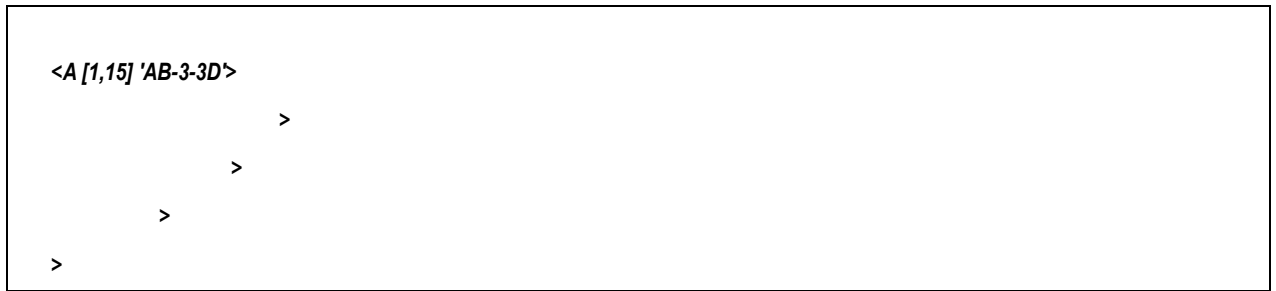
Figure 32: Sample Batch Device Processing

8.3.3   Device Info Attributes

Below table shows the possible device info to be updated by equipment. Data with asterisk (*) are mandatory and cannot be of empty value.

Device Info Attributes	Remarks
DeviceId*	Device Identification
AliasId	Device Alias Identification
SourceSubstrateId	Substrate Id where the device is located
TargetSubstrateId	Substrate Id where the device will be placed
SourcePositionId	Position where the device is located on top of the substrate
TargetPositionId	Position where the device is located on top of the target substrate
FromX	X coordinate of the device on top of the substrate
FromY	Y coordinate of the device on top of the substrate
ToX	X coordinate of the device on top of the target substrate
ToY	Y coordinate of the device on top of the target substrate
Result*	Quality of the device (Pass/Fail)
BinCode*	Bin number of the device
BinDesc*	Bin description of the device
SAPBarcode	Additional description of the bin

Table 15: Device Info to be Updated by Equipment

Note: If equipment failed to read DEVICE_DMC, handler is required to auto generate dummy parameter result.

Example: HR339987_168 where HR339987 is Lot ID

168 running number start from 1 upon new lot

8.4 Equipment System Scenario

COMMAND	HOST		EQPT	COMMENT
"**RCMD**: PP-SELECT"	S2F41	→		Command to select / open process program
		←	S2F42	Host command acknowledgement 0 or 4.
			S6F11	CEID "PPID SELECTED" to indicate process program is being selected / opened
Event Report Acknowledgement	S6F12	→		
"Set Device Info" 1) DeviceId* 2) AliasId 3) SubstrateId 4) PositionId 5) X 6) Y 7) BinCode* 8) Pick* 9) BinDesc*	S14F3	→		Equipment saves device information in memory
		←	S14F4	Status of the reply depend on the OBJACK from S14F4.
"Set Wafer Info" 1) WaferType 2) Substrate	S14F3	→		Equipment saves wafer information in memory
		←	S14F4	Status of the reply depend on the OBJACK from S14F4.
"**RCMD**: START"	S2F41	→		
		←	S2F42	Host command acknowledgement 0 or 4.
		←	S6F11	CEID "LOT PROCESSING STARTED" after input magazine automatically loaded or first substrate loaded.
Event Report Acknowledgement	S6F12	→		
		←	S6F11	CEID "DEVICE ID/WAFER ID BARCODE READ"

				[IF] ID read is matched with list of ID sent by host. **[THEN]** Start the process. **[ELSE]** Prompt out an error.
	S6F12	→		
		←	S6F11	CEID "DEVICE ID PROCESSING FINISHED" Send updated device info to host with below attributes. 1) DeviceId* 2) AliasId 3) SourceSubstrateId 4) TargetSubstrateId 5) SourcePositionId 6) TargetPositionId 7) FromX 8) FromY 9) ToX 10) ToY 11) Result* 12) BinCode* 13) BinDesc* 14) SAPBarcode
Event Report Acknowledgement	S6F12	→		

Figure 33: Equipment System Flow

9 Device and Chip Data Handling

The information contained here is specifically designed to handle complexity where required 2nd sub-level of component inside a device or unit.

	Device/Chip Information Transfer Scenario	Lot Size	Area
1.	Device only	1 Lot-20 Panels	Pre-Linked Line Equipment
2.	Device and Chip	1 Lot-1 Panel	Linked Line Equipment
3.	Device and Chip	1 Lot-20 Panels	Post-Linked Line Equipment (Before Sawing Process)
4.	Device and Chip	1 Lot-20 Devices	Post-Linked Line Equipment (After Sawing Process)

Table 16: Device and Chip Data Handling

9.1 Device and Chip XML Structure Definitions

Refer to section 8, Item 8.3.3 (Table 16: Device info to be updated by equipment).

9.2 Device Level XML Structure Definition [To Equipment]

- For equipment that requires Device data only.
- Equipment to process device with Pick = "true" and update the device information after processing.
- Other device that's not processed (e.g. "PREV FAILED" state), the device information will be maintained and sent back to host.

9.2.1 Sample Data

```
<MapData>
    <Layouts>
        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">
        </Layout>
    </Layouts>
    <DevicesMap LayoutSpecifier="DeviceLayout">
        <Devices>
            <Device>
                <DeviceId></DeviceId>
                <AliasId></AliasId>
                <TargetSubstrateId></TargetSubstrateId>
                <TargetPositionId></TargetPositionId>
                <ToX></ToX>
                <ToY></ToY>
```

```xml
                <BinCode></BinCode>

                <SAPBarcode></SAPBarcode>

                <Result></Result>

                <Pick></Pick>

                <BinDesc></BinDesc>

                <SegregateOperation />

                <TargetProduct />

            </Device>

            <Device>

        ... // properties same as above

            </Device>

            … // one or more Device XML node

        </Devices>

    </DevicesMap>

</MapData>
```

Figure 34: Format on Device Level XML Structure Definition [To Equipment]

9.2.2   Sample Data

```xml
<MapData>

    <Layouts>

        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">

        </Layout>

    </Layouts>

    <DevicesMap LayoutSpecifier="DeviceLayout">

        <Devices>

            <Device>

                <DeviceId>HUC009N0101</DeviceId>

                <AliasId/>

                <TargetSubstrateId>GoodTray02</TargetSubstrateId>

                <TargetPositionId/>

                <ToX>9</ToX>

                <ToY>7</ToY>

                <BinCode>1</BinCode>

                <SAPBarcode/>

                <Result>PASS</Result>

                <Pick>true</Pick>
```

```
            <BinDesc>0 0 0</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

        <Device>

            <DeviceId>HUA005S1115</DeviceId>

            <AliasId/>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <TargetPositionId>39</TargetPositionId>

            <ToX>1</ToX>    (column, (1,1) => top left)

            <ToY>2</ToY>    (row)

            <BinCode>0000</BinCode>

            <SAPBarcode/>

            <Result>PREV FAILED</Result> *

            <Pick>false</Pick>

            <BinDesc>BOND OFFPAD[1]</BinDesc>

            <SegregateOperation>7100</SegregateOperation>

            <TargetProduct />

        </Device>

        <Device>

            <DeviceId>HUA007E1212</DeviceId>

            <AliasId/>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <TargetPositionId>57</TargetPositionId>

            <ToX>3</ToX>

            <ToY>1</ToY>

            <BinCode>1001</BinCode>

            <SAPBarcode/>

            <Result>PREV FAILED</Result>

            <Pick>false</Pick>

            <BinDesc>VARIANCE</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

    </Devices>

  </DevicesMap>

</MapData>
```

NOTE: The device is marked as Result = FAIL in data update transaction at previous process

Figure 35: Sample Device Level XML Structure Definition [To Equipment]

9.3   Device Level XML Structure Definition [To Host]

```
<MapData>
    <Layouts>
        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">
        </Layout>
    </Layouts>
    <DevicesMap LayoutSpecifier="DeviceLayout">
        <Devices>
            <Device>
                <DeviceId></DeviceId>
                <AliasId></AliasId>
                <SourceSubstrateId></ SourceSubstrateId> // additional device properties update by equipment if it is available or there
is movement of device
                <TargetSubstrateId></TargetSubstrateId>
                <FromX></FromX>
                <FromY></FromY>
                <ToX></ToX>
                <ToY></ToY>
                <BinCode></BinCode>
                <SAPBarcode></SAPBarcode>
                <Result></Result>
                <BinDesc></BinDesc>
                <SegregateOperation></SegregateOperation>
                <TargetProduct></TargetProduct>
            </Device>
            <Device>
            … // properties same as above
            </Device>
        ... // one or more Device XML node
        </Devices>
    </DevicesMap>
</MapData>
```

Figure 36: Format on Device Level XML Structure Definition [To Host]

```
<MapData>

    <Layouts>

        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">

        </Layout>

    </Layouts>

    <DevicesMap LayoutSpecifier="DeviceLayout">

      <Devices>

        <Device>

            <DeviceId>HUC009N0101</DeviceId>

            <AliasId/>

            <SourceSubstrateId>GoodTray01</SourceSubstrateId>

            <TargetSubstrateId>GoodTray02</TargetSubstrateId>

            <SourcePositionId/>

            <TargetPositionId/>

          <FromX>0</FromX>

           <FromY>1</FromY>

            <ToX>9</ToX>

            <ToY>7</ToY>

            <BinCode>1</BinCode>

            <SAPBarcode/>

            <Result>PASS</Result>

            <BinDesc>AB-3-3B</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

        <Device>

            <DeviceId>HUA005S1115</DeviceId>

            <AliasId/>

            <SourceSubstrateId></SourceSubstrateId>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <SourcePositionId/>

            <TargetPositionId>39</TargetPositionId>

            <FromX>0</FromX>

            <FromY>2</FromY>

          <ToX>5</ToX>

            <ToY>7</ToY>
```

```xml
            <BinCode>0000</BinCode>

            <SAPBarcode/>

            <Result>FAIL</Result> => ("REPAIR" status for test process)

            <BinDesc>BOND OFFPAD[1]</BinDesc>

            <SegregateOperation>7100</SegregateOperation>

            <TargetProduct />

        </Device>

        <Device>

            <DeviceId>HUA007E1212</DeviceId>

            <AliasId/>

            <SourceSubstrateId></SourceSubstrateId>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <SourcePositionId/>

            <TargetPositionId>57</TargetPositionId>

            <FromX></FromX>

            <FromY></FromY>

            <ToX>3</ToX>

            <ToY>1</ToY>

            <BinCode>1001</BinCode>

            <SAPBarcode/>

            <Result>FAIL</Result>

            <BinDesc>VARIANCE</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

    </Devices>

  </DevicesMap>

</MapData>
```

Figure 37: Sample Device Level XML Structure Definition [To Host]

9.4　Chip Level Properties Definition

For equipment that handles both Device and Chip data.

Chip Info Attributes	Data Type	Remarks
Id*	Alphanumeric	Chip identification.
PositionX	Float	X distance from a fiducial/reference of the chip on top of the target substrate/board/material (mm). Range: -999.999 to 999.999
PositionY	Float	Y distance from a fiducial/reference of the chip on top of the target substrate/board/material (mm). Range: -999.999 to 999.999
Theta	Float	Any floating value in this range. Range: 0.000 to 360.000
Sequence	Alphanumeric	Group identifier for a string/list of chips.
SequenceResult	Alphanumeric	Quality of the string/list of chips (Value = "PASS", "FAIL" or "REPAIR")
SequenceBinDesc	Alphanumeric	Bin description of the string/list of chips.
Result*	Alphanumeric	Quality of the chip (Value = "PASS", "FAIL" or "REPAIR") *Value = "PREV FAILED" to indicate chip is marked FAIL at previous process.
BinCode*	Alphanumeric	Bin number of the chip. *NOTE: Equipment can define own BinCode value for reject types.
Pick*	Alphanumeric	Pick indicator for processing. *NOTE: Only provided by host, not reported by equipment.
BinDesc*	Alphanumeric	Bin description of the chip.

Table 17: Chip Level Properties Definition

Note: Property fields with asterisk (*) are mandatory and cannot be of empty value.

9.4.1　Device and Chip Level XML Structure Definition [To Equipment]

- Equipment to process chip with Pick = "true" and update the chip information after processing.
- Other chip that's not processed (e.g. "PREV FAILED" state), the chip information will be maintained and sent back to host.

```xml
<MapData>
    <Layouts>
        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">
        </Layout>
        <Layout LayoutId="ChipLayout" DefaultUnits="mm">
        </Layout>
    </Layouts>
    <DevicesMap LayoutSpecifier="DeviceLayout/ChipLayout">
        <Devices>
            <Device>
                <DeviceId></DeviceId>
                <AliasId></AliasId>
                <TargetSubstrateId></TargetSubstrateId>
                <TargetPositionId></TargetPositionId>
                <ToX></ToX>
                <ToY></ToY>
                <BinCode></BinCode>
                <SAPBarcode></SAPBarcode>
                <Result></Result>
                <Pick></Pick>
                <BinDesc></BinDesc>
                <SegregateOperation />
                <TargetProduct />
            </Device>
            …// one or more Device XML node
        </Devices>
        <Overlay MapName="Chip Info" MapVersion="1" >
         <ChipsMap>
          <Device Id="">
                <Chips>
```

```
<Chip Id="" PositionX="" PositionY="" Theta="" Sequence="" BinCode="" SequenceResult="" SequenceBinDesc="" Result=""

BinDesc="" Pick="" />

        …. // one or more Chip XML node

          </Chips>

            </Device>

        … // one or more Device XML node

        </ChipsMap>

    </Overlay>

  </DevicesMap>

</MapData>
```

Figure 38: Format on Device and Chip Level XML Structure Definition [To Equipment]

9.4.1.1 Sample Data

```
<MapData>

    <Layouts>

        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">

        </Layout>

        <Layout LayoutId="ChipLayout" DefaultUnits="mm">

          </Layout>

    </Layouts>

    <DevicesMap LayoutSpecifier="DeviceLayout/ChipLayout">

      <Devices>

        <Device>

            <DeviceId>HUC009N0101</DeviceId>

            <AliasId/>

            <TargetSubstrateId>GoodTray02</TargetSubstrateId>

            <TargetPositionId/>

            <ToX>9</ToX>

            <ToY>7</ToY>

            <BinCode>1</BinCode>

            <SAPBarcode/>

            <Result>PASS</Result>

            <Pick>true</Pick>

            <BinDesc>0 0 0</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

        <Device>
```

```xml
            <DeviceId>HUA005S1115</DeviceId>

            <AliasId/>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <TargetPositionId>39</TargetPositionId>

            <ToX>5</ToX>

            <ToY>7</ToY>

            <BinCode>0000</BinCode>

            <SAPBarcode/>

            <Result>PREV FAILED</Result>

            <Pick>false</Pick>

            <BinDesc>BOND OFFPAD[1]</BinDesc>

            <SegregateOperation>7100</SegregateOperation>

            <TargetProduct />

        </Device>

        <Device>

            <DeviceId>HUA007E1212</DeviceId>

            <AliasId/>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <TargetPositionId>57</TargetPositionId>

            <ToX>3</ToX>

            <ToY>1</ToY>

            <BinCode>1001</BinCode>

            <SAPBarcode/>

            <Result>PREV FAILED</Result>

            <Pick>false</Pick>

            <BinDesc>VARIANCE</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

    </Devices>

    <Overlay MapName="Chip Info" MapVersion="1" >

     <ChipsMap>

       <Device Id="HUC009N0101">

            <Chips>
```

ams OSRAM Substrate Mapping & Validation Functional Specification

```
                <Chip Id="PanelId01XXYYD123457_R" PositionX="72000" PositionY="-38000" Theta="180" Sequence="SG1"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="1" Result="PASS" BinDesc="A B C" Pick="true" />
                    <Chip Id="PanelId01XXYYD123458_R" PositionX="33000" PositionY="-41000" Theta="" Sequence=""
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="5023" Result="PREV FAILED" BinDesc="BROKEN CIRCUIT"
Pick="false" />
            </Chips>
        </Device>
        <Device Id="HUA005S1115">
            <Chips>
                <Chip Id="PanelId01XXYYD123450_B" PositionX="20000" PositionY="-34000" Theta="" Sequence="SG2"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="1" Result="PASS" BinDesc="A B C" Pick="true" />
                <Chip Id="PanelId01XXYYD123451_B" PositionX="32000" PositionY="-45000" Theta="" Sequence=""
SequenceResult="" SequenceBinDesc="" BinCode="5013" Result="REPAIR" BinDesc="BROKEN CIRCUIT" Pick="true" />
            </Chips>
        </Device>
        <Device Id="HUA007E1212">
            <Chips>
                <Chip Id="PanelId01XXYYD123460_G" PositionX="12000" PositionY="-33000" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="1" Result="PASS" BinDesc="A B C" Pick="true" />
                <Chip Id="PanelId01XXYYD123461_G" PositionX="13000" PositionY="-49000" Theta="" Sequence=""
SequenceResult="" SequenceBinDesc="" BinCode="5003" Result="PREV FAILED" BinDesc="BROKEN CIRCUIT" Pick="false" />
            </Chips>
        </Device>
        </ChipsMap>
    </Overlay>
</DevicesMap>
</MapData>
```

Figure 39: Sample Device and Chip Level XML Structure Definition [To Equipment]

9.4.2   Device and Chip Level XML Structure Definition [To Host]

```
<MapData>
    <Layouts>
        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">
        </Layout>
        <Layout LayoutId="ChipLayout" DefaultUnits="mm">
        </Layout>
```

```
</Layouts>

    <DevicesMap LayoutSpecifier="DeviceLayout/ChipLayout">

        <Devices>

            <Device>

                <DeviceId></DeviceId>

                        <AliasId></AliasId>

                <SourceSubstrateId></SourceSubstrateId> // additional device properties update by equipment

                <TargetSubstrateId></TargetSubstrateId>

                <SourcePositionId></SourcePositionId/>

                <TargetPositionId></TargetPositionId/>

                <FromX></FromX>

                <FromY></FromY>

                <ToX></ToX>

                <ToY></ToY>

                <BinCode></BinCode>

                <SAPBarcode></SAPBarcode>

                <Result></Result>

                <BinDesc></BinDesc>

                <SegregateOperation></SegregateOperation>

                <TargetProduct></TargetProduct>

            </Device>

                ... // one or more Device XML node

        </Devices>

        <Overlay MapName="Chip Info" MapVersion="1" >

            <ChipsMap>

                    <Device Id="">

                        <Chips>

                        <Chip Id="" PositionX="" PositionY="" Theta="" Sequence="" SequenceResult="" SequenceBinDesc=""

BinCode="" Result="" BinDesc="" />

                                .... // one or more Chip XML node

                        </Chips>

                    </Device>

                    … // one or more Device XML node

                </ChipsMap>

        </Overlay>

    </DevicesMap>

</MapData>
```

Figure 40: Format on Device and Chip Level XML Structure Definition [To Host]

9.4.2.1   Sample Data

```
<MapData>
    <Layouts>
        <Layout LayoutId="DeviceLayout" DefaultUnits="mm">
        </Layout>
        <Layout LayoutId="ChipLayout" DefaultUnits="mm">
        </Layout>
    </Layouts>
    <DevicesMap LayoutSpecifier="DeviceLayout/ChipLayout">
      <Devices>
        <Device>
            <DeviceId>HUC009N0101</DeviceId>
            <AliasId/>
            <SourceSubstrateId>GoodTray01</SourceSubstrateId>
            <TargetSubstrateId>GoodTray02</TargetSubstrateId>
            <SourcePositionId/>
            <TargetPositionId/>
            <FromX>0</FromX>
            <FromY>1</FromY>
            <ToX>9</ToX>
            <ToY>7</ToY>
            <BinCode>1</BinCode>
            <SAPBarcode/>
            <Result>PASS</Result>
            <BinDesc>0 0 0</BinDesc>
            <SegregateOperation />
            <TargetProduct />
        </Device>
        <Device>
            <DeviceId>HUA005S1115</DeviceId>
            <AliasId/>
            <SourceSubstrateId></SourceSubstrateId>
            <TargetSubstrateId>B21E1074</TargetSubstrateId>
            <SourcePositionId/>
            <TargetPositionId>39</TargetPositionId>
            <FromX>0</FromX>
            <FromY>2</FromY>
```

```
            <ToX>5</ToX>

            <ToY>7</ToY>

            <BinCode>0000</BinCode>

            <SAPBarcode/>

            <Result>FAIL</Result>

            <BinDesc>BOND OFFPAD[1]</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

        <Device>

            <DeviceId>HUA007E1212</DeviceId>

            <AliasId/>

            <SourceSubstrateId></SourceSubstrateId>

            <TargetSubstrateId>B21E1074</TargetSubstrateId>

            <SourcePositionId/>

            <TargetPositionId>57</TargetPositionId>

            <FromX></FromX>

            <FromY></FromY>

            <ToX>3</ToX>

            <ToY>1</ToY>

            <BinCode>1001</BinCode>

            <SAPBarcode/>

            <Result>FAIL</Result>

            <BinDesc>VARIANCE</BinDesc>

            <SegregateOperation />

            <TargetProduct />

        </Device>

    </Devices>

    <Overlay MapName="Chip Info" MapVersion="1" >

      <ChipsMap>

      <Device Id="HUC009N0101">

          <Chips>

            <Chip Id="PanelId01XXYYD123457_R" PositionX="25000" PositionY="-32000" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="1" Result="PASS" BinDesc="A B C" />

            <Chip Id="PanelId01XXYYD123458_R" PositionX="39000" PositionY="-41000" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="5012" Result="FAIL" BinDesc="BROKEN CIRCUIT" />

          </Chips>

      </Device>
```

```
<Device Id="HUA005S1115">
<Chips>
            <Chip Id="PanelId01XXYYD123460_G" PositionX="26000" PositionY="-33000" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="5004" Result="REPAIR" BinDesc="D E F" />
            <Chip Id="PanelId01XXYYD123461_G" PositionX="36000" PositionY="-42000" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="5005" Result="FAIL" BinDesc="OTHER ERROR" />
        </Chips>
      </Device>
      <Device Id="HUA007E1212">
        <Chips>
          <Chip Id="PanelId01XXYYD123450_B" PositionX="2" PositionY="3" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="1" Result="PASS" BinDesc="A B C" />
          <Chip Id="PanelId01XXYYD123451_B" PositionX="30500" PositionY="-47000" Theta="" Sequence="SG3"
SequenceResult="FAIL" SequenceBinDesc="FailOpen" BinCode="5099" Result="PREV FAILED" BinDesc="BAD WIRE" />
          </Chips>
      </Device>
    </ChipsMap>
    </Overlay>
</DevicesMap>
</MapData>
```

Figure 41: Sample Device and Chip Level XML Structure Definition [To Host]

9.5   SECS/GEM Message Communication Flows

	Device/Chip Information Transfer Scenario	Lot Size	Area
1.	Device and Chip	1 Lot-1 Panel	Linked Line Equipment
2.	Device and Chip	1 Lot-20 Panel	Post-Linked Line Equipment (Before Sawing Process)
3.	Device and Chip	1 Lot-20 Device	Post-Linked Line Equipment (After Sawing Process)

Table 18: SECS/GEM Message Communication Flows

- The following message communication definition below is for those equipment involved in above scenario 1 only.

9.5.1 Device and Chip Data Download to Equipment

- S14F1, F2 (1 Panel Data Set)
- Sample Format:

9.5.1.1 Machine request Panel Data Set to Host (S14F1)

```
<L [5,1]
    <A [0,1] > *[OBJSPEC] Specific object instance
    <A [9,2] 'Lot'> *[OBJTYPE] Identifier for group or class of objects, 'Lot','Substrate','Device' depends on machine,
LinkedLine will be 'Lot', Post-Linked Line Equipment (Before Sawing Process) will be 'Substrate' and Post-Linked Line
Equipment (After Sawing Process) will be 'Device'
    <L [1,3]
        <A [6,1] 'HTG32100'> *[OBJID] Identifier for an object, depend on the OBJTYPE, 'Lot' will be Lot ID, 'Substrate' will be
Substrate ID, 'Device' will be Device ID
    >
    <L [1,4]
        <L [3,1]
            <A [13,1] 'SubstrateType'> *[ATTRID] Identifier for an attribute for a specific type of object
            <A [5,2] 'Lot'> *[ATTRDATA] Contains a specific attribute value for a specific object 'Lot','Substrate','Device' depends
on machine, LinkedLine will be 'Lot', Post-Linked Line Equipment (Before Sawing Process) will be 'Substrate' and Post-Linked
Line Equipment (After Sawing Process) will be 'Device'
            <U1 [1,3] 0> *[ATTRRELN] Attribute relationship
        >
    >
    <L [1,5]
        <A [7,1] 'DeviceChipInfo'> *[ATTRID] Identifier for an attribute for a specific type of object
    >
>
```

Figure 42: Sample Machine Request Panel Data Set to Host

9.5.1.2 Host reply to machine with S14F2

```
<L [2,1]
    <L [1,1]
      <L [2,1]
        <A [6,1] 'HTG32100'> *[OBJID] Identifier for an object
        <L [1,2]
          <L [2,1]
            <A [7,1] 'DeviceChipInfo'> *[ATTRID] Identifier for an attribute for a specific type of object
            <A [10,1] 'UEsDBBQAAAAIAAZpFFky0i7RmEABAORwNAATA'> *Base64 string format content
          >
        >
          >
        >
    <L [2,2]
```

```
    <U1 [1,1] 0> *[OBJACK] Acknowledge code
      <L [0,1]
        >
      >
    >
```

Figure 43: Sample Host Reply to Machine

9.5.2 Device and Chip Data Upload to Host

- S14F3, F4
- Sample Format:

9.5.2.1 Equipment Upload Data to Host using S14F3: (Sample data)

```
<L>
    <A/>
    <A>Lot</A> 'Lot','Substrate','Device' depends on machine, LinkedLine will be 'Lot', Post-Linked Line Equipment (Before
Sawing Process) will be 'Substrate' and Post-Linked Line Equipment (After Sawing Process) will be 'Device'
        <L>
        <A> HTG32100</A> Depend on the OBJTYPE, 'Lot' will be Lot ID, 'Substrate' will be Substrate ID, 'Device' will be
Device ID
        </L>
        <L>
```

<L>

<A>DeviceChipInfo</A>

<A>UEsDBC0AAAAIAChxFFnzEbgh/////////</A> *Base64 string format content

</L>

</L>

</L>

Figure 44: Sample Equipment Upload Data to Host

10 PROJECT PROCESSING REQUIREMENTS

10.1 Implementation Requirements

Complete functional scope as described

10.2 Technical Documentation

Refer to the reference for complete list of technical documentation.

10.3 Acceptance Conditions

10.3.1 End Acceptance Location

ams OSRAM Worldwide (refer to Geographical Validity location).

10.3.2 Test Data for Acceptance

Test files can be provided upon request.

10.3.3 Acceptance Criteria

The criteria for successful acceptance are fulfilled if the functional fulfillment is specified according to the functional specification and the technical data requirements for each application are fulfilled.

10.3.4 Acceptance Documentation

Functional specification / test plan

10.3.5 Acceptance Report

An acceptance report will be compiled by the contract provider in which failure which occurs during the acceptance test or the successful acceptance is confirmed.

11 ATTACHMENTS

11.1 Substrate Mapping Manual / Documentation

- User manual in English – softcopy (CD) and one hardcopy.
- User manual should include following:
    - ✓ Operation procedure and configuration guide with screenshots.
    - ✓ Software implementation flow chart for troubleshooting purpose.
- Please attach the relevant Substrate Mapping Manual along with this documentation.

11.2 Log Files / Test Data / Test Environment

- According to agreement: Provision of test files.
- ALL Substrate Mapping verification logs need to be attached as proof of testing for validation.

11.3 Library Files

- The library file used to perform the testing need to be attached here in the format of a LIB, SML, XML or TXT file.

11.4 Software / Tools

- Complete Equipment Software Backup in CD.
- The features specified in this specification are developed for ams OSRAM Worldwide use only.

Supplier must not disclose any related information to third party (parties), either verbally or through other communication channels.

Document History

Version	Date	Short description of change	Process Owner/Expert
1.0	20-May-2014	Initial Release	Raymond Chow & Mohd Fitri
1.1	06-Jun-2014	1.Changes on 3.1.1: Normal process to include 3.4: Failure Handling due to network down 2.Changes on 3.3.3: Equipment uploads MapData, S6F11 W 3.Changes on 3.4: Failure Handling 4.Typo error on 5.2: USB Interface 5.Added new case of exception handling 3:2:3: Equipment failed to read SubstrateId 6.Changes on section 4.6 Non SECS/GEM Compliant Equipment. Added new items 4.6.1 for flat file standard naming convention, and 4.6.2 for example of standard process flow 7.Add new section 4.7: Substrate Mapping with Process Parameters 8.Add new section 7.2.3: TransferMap for Single Chip example	Raymond Chow & Mohd Fitri
1.2	05-Aug-2014	1.Remove Section 11: Payment Release Procedure upon Procurement 2.Change Section 4.7 to 4.6.3 3.Modify Section 3.4: Failure Handling content 4. Modify Section 6	Raymond Chow
1.3	01-Dec-2014	1.Modify Section 4.3 to include AxisDirection 2.Remove Section 4.6.3 from the document 3.Include AxisDirection in all XML format	Raymond Chow & Mohd Fitri
1.4	23-Feb-2015	1. Modify Section 3.3.3: Description for "MapVersion"	Raymond Chow
1.5	15-Jun-2015	1.Include "DefaultUnits" as mandatory attribute in XML 2.Make 'Pick' value as lowercase 3.Change Origin X & Y from 1,1 to 0,0 to comply with SEMI E142	Mohd Fitri
1.6	06-Apr-2018	1.Fix TransferMap structure for multiple wafers placed on the same substrate	Mohd Fitri
1.7	12-Sep-2019	1. Remove multichip related information. There's no use case for this	Mohd Fitri
1.8	02-Mar-2020	1. Introduction of WaferMap in E142	Tan, Wai Tek (Drafter) Mohd Fitri
1.8.1	27-Nov-2020	1.Convert to DMA standard documentation template	Mohd Fitri
1.8.2	26-Apr-2021	1. 3.3.2.2: Change BinCode in XML sample to match Figure 3 2. 3.3.4.2: Change the timing of wafer upload from equipment 3. 3.3.4.2: Change BinCode in XML sample to match Figure 3.1 4. 7.3.3: Change BinCode in XML sample to match Figure 12	Roselle Dagasdas
1.9	01-Dec-2021	1. Changed OSRAM logo to new ams OSRAM logo in cover page and table of content page 2. Added Regensburg in Geographical Validity on cover page 3. Changed document footer to 'ams OSRAM E142 Substrate Mapping Specification' 4. Changed reference of 'OSRAM OS' to 'ams OSRAM' everywhere 5. 1.1: Rephrase the purpose of the document 6. Added 2 new references SEMI M12 & SEMI M13 for wafer related 7. Replaced 'cim_global@osram-os.com' email reference and generalized it to 'ams OSRAM' 8. Replaced reference of 'machine' with 'equipment' as a standard term 9 5.1 Changed title to 'Substrate ID Reader' as general requirement covering strip and wafer type of substrate	Mohd Fitri
1.10	08-Dec-2021	1. 4.6: Redefined origin coordinate of wafer from 1,1 to 0,0. Changed Figure 15 accordingly 2. Corrected the formatting and indentation errors 3. Redesigned main page with proper ams OSRAM branding format 4. Captioned all tables and figures in this document. Listed them on page 3 and 4 5. Fixed broken in-page hyperlinks	Mohd Fitri
1.11	03-Sep-2024	1. Moved Device and Substrate Validation from GTOS Appendix to this document Appendix. Added on Section 8 and 9 2. Changed the document name from 'ams OSRAM E142 Substrate Mapping Functional Specification' to 'ams OSRAM Substrate Mapping & Validation Functional Specification' to be more generic 3. Updated 'Purpose of the Document' content 4. Added SEMI E142 as one of the documents in 'References' 5. Changed department name from DMA to OT SEMI	Kale Dasan Mohd Fitri Diana Gnanathikam

References

No.	Document Title
1	GTOS: Global Tool Operation Specification
2	SEMI E142: Specification for Substrate Mapping
2	SEMI E30: Generic Model for Communications & Control of MFG Equipment (GEM)
3	SEMI E5: SEMI Equipment Communication Standard 2 Message Content (SECS-II)
4	SEMI E37: High Speed SECS Message Services (HSMS) Generic Services (GS)
5	SEMI T9: Specification for Marking of Metal Lead-Frame Strips with A Two-Dimensional Data Matrix Code Symbol.
6	SEMI M12: Specification for Serial Alphanumeric Marking of The Front Surface of the Wafers
7	SEMI M13: Specification for Alphanumeric Marking of Silicon Wafers