



10.2.2 From the host point of view, an object is instantiated if the host is able to query the equipment about that object, its current state, and other attributes. Once instantiated, the object is considered destroyed (no longer instantiated) if the response to such queries is “unknown object”.

10.2.3 Summary of reticle pod object instantiation:

1. Bind, ReticleTransferJob, or PodNotification Service;
2. PodID read with no currently existing pod objects having the PodID just read; and
3. ProceedWithPod or CancelPod Service on an UNASSOCIATED port with a pod.

10.2.4 *Reticle Pod Object Identifier (ObjID)*

10.2.4.1 The purpose of an Object Identifier is to allow references to an object within the system. The object identifier is created when an object is instantiated and should be unchanged or persistent until the end of the object lifecycle. The Object Identifier shall be unique at the equipment during lifecycle of the object. The PodID is the Reticle Pod Object Identifier. The equipment is responsible for ensuring uniqueness of the PodID prior to instantiation by the bind, pod notification, or ReticleTransferJob service.

10.2.5 *Reticle Pod Object Destruction*

10.2.5.1 Normally, the Reticle Pod Object reaches the end of its lifecycle when the reticle pod is unloaded from the equipment. Abnormally, the Reticle Pod Object reaches the end of its lifecycle when a CancelBind, CancelReticleTransferJob, or CancelPodNotification service is executed prior to the reticle pod being loaded, or when an equipment based pod verification fails following pod instantiation by the bind service.

10.2.5.2 Summary of reticle pod object destruction:

1. A reticle pod is unloaded from the equipment;
2. A CancelBind, CancelReticleTransferJob or CancelPodNotification service is received; and
3. An equipment based verification fails (after the object has been instantiated via the bind services).

10.3 *Reticle Pod Attribute Definitions*

10.3.1 The following table contains the attributes that are of importance to the host and/or the equipment in order to manage the history and the reports about the reticle pod object.

10.3.2 *REQD Column*

10.3.2.1 All attributes in the following table are required to be associated with the reticle pod object. However only the attributes marked with a “Y” in the REQD column are always required to be maintained and updated by the equipment. The attributes marked with an “N” in the REQD column are only required to be maintained if they are provided by the host by either the Bind, PodNotification, ReticleTransferJob or ProceedWithPod Services or if the equipment has means of determining the attribute values. (For example, if the equipment has a ReticleID reader, the equipment can determine the ContentMap).

10.3.3 *ACCESS Column*

10.3.3.1 Even though a value may be marked as RO (read only), the initial value for the attribute may be provided by the host when attached to either the Bind, PodNotification, ReticleTransferJob or ProceedWithPod services. The only other time the PodCapacityStatus attributes are updated is at the first ProceedWithPod service.

10.3.4 *Pod Attribute Definition Table*

Table 6 Pod Attribute Definition

Attribute Name	Definition	Access	Reqd	Form
ObjType	Object type.	RO	Y	Text equal to “Reticle Pod”.
ObjID	Object identifier.	RO	Y	Text 1 to 80 characters equal to the PodID.
Capacity	Maximum number of reticles in pod.	RO	Y	Positive integer. If a pod arrives at a load port with no warning the default value is one.

<i>Attribute Name</i>	<i>Definition</i>	<i>Access</i>	<i>Reqd</i>	<i>Form</i>
PodIDStatus	Current state of the PodID verification.	RO	Y	Enumerated: ID NOT READ, WAITING FOR HOST ON ID STATUS, ID VERIFICATION OK, ID VERIFICATION FAILED.
ReticlePodAccessing-Status	The current accessing state of the reticle pod by the equipment. The current substate of the ReticlePodAccessingStatus state model.	RO	Y	Enumerated: NOT AVAILABLE, AVAILABLE, IN ACCESS, COMPLETE.
ContentMap	Ordered list of reticle identifiers corresponding to slot 1,2,3.....n.	RO	Y	Ordered list of n elements, where n is equal to the value of "Capacity" above, and each element consists of a ReticleID. When a slot has no reticle, the ReticleID value should be null.
ReticlePodLocationID	Identifier of current location of the reticle pod.	RO	Y	Text 1 to 80 characters.
ReticlePodLocking-Status	The current state of pod locking by the equipment. The current substate of the ReticlePodLockingStatus.	RO	Y	Enumerated: NOT LOCKED, RELEASED AND LOCKED, HOLD.
SlotMap	Ordered List of slot status as provided by the host until a successful slot map read, then as read by the equipment.	RO	Y	Ordered List of n elements where n is equal to the value of "Capacity" above. 1. Enumerated ₁ . n. Enumerated _n Enumerated: UNDEFINED, EMPTY, CORRECTLY OCCUPIED. The number shown above is the slot number.
SlotMapStatus	Current state of slot map verification.	RO	Y	Enumerated: SLOT MAP NOT READ, WAITING FOR HOST ON SLOT STATUS, SLOT MAP VERIFICATION OK, SLOT MAP VERIFICATION FAILED.

10.3.5 Rules for Reticle Pod Attributes

- The equipment shall change object attributes, ContentMap and SlotMap, provided by the host. All other attributes, such as LocationID, shall be set and maintained by the equipment.
- The attributes, Capacity, ContentMap, Reticle count, shall be provided with Bind, PodNotification, ReticleTransferJob, or ProceedWithPod service before or when SlotMap is provided.
- The SlotMap shall be provided with Bind, PodNotification, ReticleTransferJob or ProceedWithPod to verify PodID, when the SlotMap verification is equipment based. And it shall not be provided when the SlotMap verification is host based.
- Reticle pod properties may be provided before the reticle pod arrives as part of the Bind, PodNotification, or ReticleTransferJob service and should be retained until either a CancelBind, CancelPodNotification, or CancelReticleTransferJob service is received or the reticle pod is removed.
- Reticle pod properties may also be provided by the ProceedWithPod service. The reticle pod properties that are provided by the ProceedWithPod service may differ based whether or not the object is instantiated by the service.



- Reticle pod properties that are required shall be actively updated by the equipment.

10.3.6 *Reticle Pod Location*

10.3.6.1 A reticle pod location, signified by LocationID, is used for tracking. A reticle pod location is any physical area that is capable of holding a pod. It is not intended to represent entire mechanisms, which may have a variety of other properties of interest, but only that portion where a reticle pod may rest.

10.3.7 *Reticle Pod Location Examples*

10.3.7.1 Reticle Pod Locations include reticle pod load port locations, internal pod buffer locations, as well as grippers, conveyors, and elevators that are used internally for moving the pod from one fixed location to another.

10.3.8 *Slot Map Relation to Content Map* — The slot map attribute and content map attribute hold similar information. The purpose of these attributes differs. The slot map is provided so that the equipment or host can quickly verify that the pod has reticles correctly placed in the correct slot (as provided by the host). This verification is based on a slot map read. The content map is provided so that the host can communicate the specific ReticleID in a specific slot as delivered and that the equipment can communicate the specific ReticleID that it places in a specific slot.

10.3.9 *Reticle Pod Location Naming* — All locations shall be assigned a unique name. Information about the reticle pod location can be obtained by querying the Pod Object for the ReticlePodLocationID or by asking the equipment for the PodLocationMatrix. The text form of the ReticlePodLocationID shall be descriptive of the location.

10.3.10 *Capacity*

10.3.10.1 The Capacity parameter can be sent to the equipment by the host in the PodNotification, Bind, ReticleTransferJob, or the ProceedWithPod service. However the equipment shall update this

10.3.10.2 Parameter based on the results of the read slot map operation. Furthermore, the equipment shall update the parameter based on its own actions. If the equipment does not know the value of Capacity prior to instantiation, the equipment shall instantiate the reticle pod object with the value of one for Capacity.

10.3.11 *The ReticlePodAccessing*

10.3.11.1 Status is used by the host to know whether or not the reticle pod owned by the equipment can be transferred from the equipment.

10.3.11.2 Enumerated values of ReticlePodAccessing-Status correspond to the substates of ReticlePodAccessingStatus (see Figure 2).

10.4 *Reticle Pod State Model*

10.4.1 The purpose of the Reticle Pod State Model is to define the host's view of a reticle pod. The equipment shall maintain a separate and independent state model for each reticle pod in/at the equipment.

10.4.2 *Reticle Pod State Model Diagram*

10.4.3 *Reticle Pod State Definitions*

10.4.3.1 *RETICLE POD* — The RETICLE POD state has four ANDed (orthogonal) substates: RETICLE POD ID STATUS, RETICLE POD SLOT MAP STATUS, RETICLE POD ACCESSING STATUS, AND RETICLE POD CLAMPING STATUS.

10.4.3.1.1 *RETICLE POD ACCESSING STATUS* — This is a substate of RETICLE POD and indicates the current accessing status of the pod. It has three substates, NOT ACCESSED, IN ACCESS, and COMPLETE. The initial default entry substate is NOT ACCESSED.

10.4.3.1.1.1 *NOT ACCESSED* — This is a substate of RETICLE POD ACCESSING STATUS and is active when the reticle pod has not been opened. It has two substates NOT AVAILABLE and AVAILABLE.

10.4.3.1.1.1.1 *NOT AVAILABLE* This is a substate of NOT ACCESSED and is active when the reticle pod has been instantiated via service but has not been received by the equipment.

10.4.3.1.1.1.2 *AVAILABLE* — This is a substate of NOT ACCESSED and is active when the reticle pod has been received by the equipment but not opened.

10.4.3.1.1.2 *IN ACCESS* — This is a substate of RETICLE POD ACCESSING STATUS and is active when reticle pod has been opened once, and the reticle pod should not be unloaded from the equipment. In this state the slot map is read and reticles may be moved in and out of the reticle pod.

10.4.3.1.1.3 *COMPLETE* — This is a substate of RETICLE POD ACCESSING STATUS and is active when all known activity, as defined by the ReticleTransferJob service, for the reticle pod has completed, or the PodComplete service has been received, and the reticle pod has been closed. The reticle pod may be unloaded from the equipment.

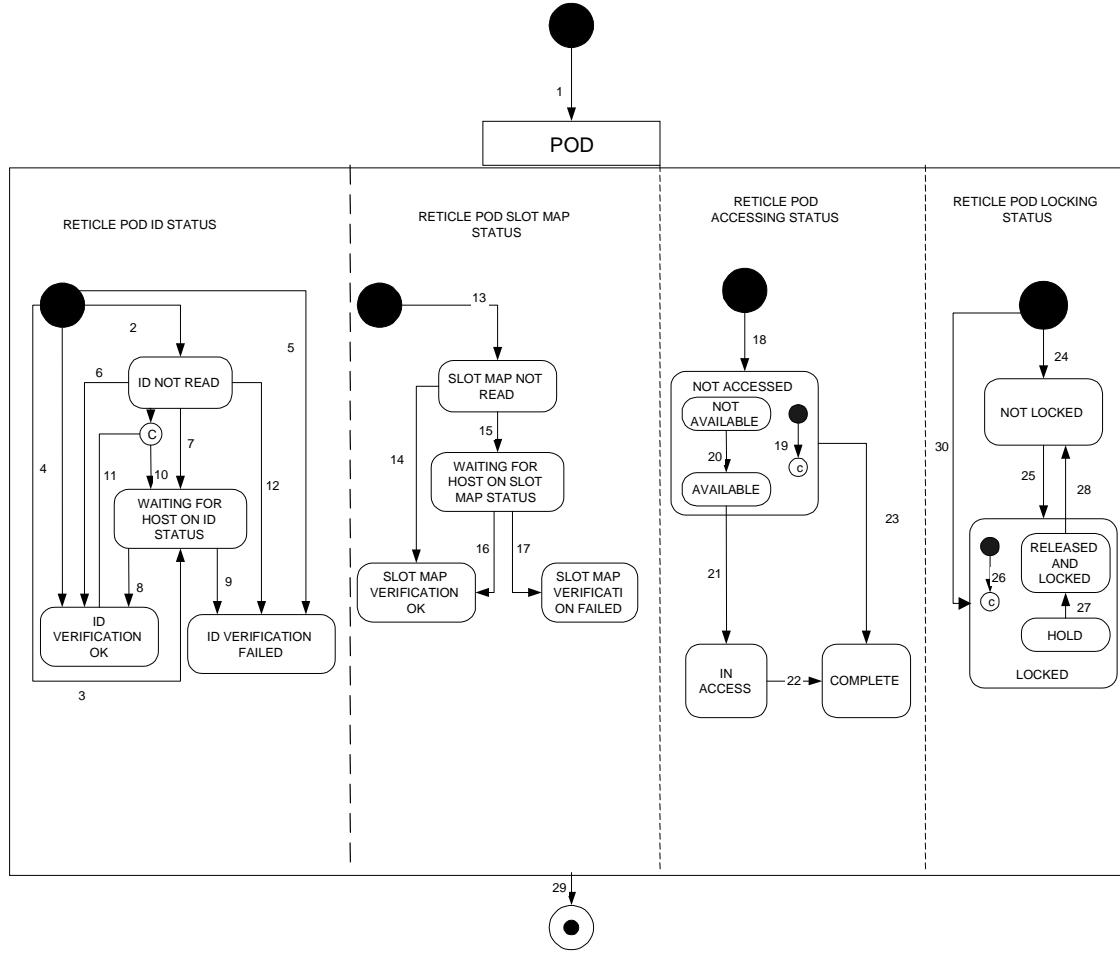


Figure 2
Reticle Pod State Model Diagram

10.4.3.1.2 *RETICLE POD LOCKING STATUS* — This is a substate of RETICLE POD and indicates the current status of the pod with respect to removability.

10.4.3.1.2.1 *NOT LOCKED* — This is a substate of RETICLE POD LOCKING STATUS and is active when there are no physical or logical mechanisms that prevent removal of the reticle pod by an external entity.

10.4.3.1.2.2 *LOCKED* — This is a substate of RETICLE POD LOCKING STATUS and is active when there are physical mechanisms that prevent removal of the reticle pod by an external entity. It has two substates RELEASED AND LOCKED and HOLD.

10.4.3.1.2.2.1 *RELEASED AND LOCKED* — This is a substate of LOCKED and is active when the pod may be released by the equipment.



10.4.3.1.2.2.2 *HOLD* — This is a substate of LOCKED and is active when there are physical or logical mechanisms that prevent removal of the pod engaged and the pod release flag is set to host release and the PodRelease service has not been received.

10.4.3.1.3 *RETICLE POD ID STATUS* — This is a substate of RETICLE POD and indicates the current status of the pod with respect to its identifier. It has four substates, ID NOT READ, WAITING FOR HOST ON ID STATUS, ID VERIFICATION FAILED, ID VERIFICATION OK. The initial substate is conditional based on information the equipment has about the reticle pod. When the PodID is provided by the Bind, ReticleTransferJob, or the PodNotification service, the reticle pod object shall be instantiated in the ID NOT READ substate. When the PodID is provided by the PodID read, the reticle pod shall be instantiated in the WAITING FOR HOST ON ID STATUS substate. When the Reticle Pod is instantiated by the ProceedWithPod service, the reticle pod shall be instantiated in the ID VERIFICATION OK substate. Finally when the reticle pod is instantiated by the CancelPod service, the pod will be instantiated in the ID VERIFICATION FAILED substate.

10.4.3.1.3.1 *ID NOT READ* — This is a substate of RETICLE POD ID STATUS. This state is active whenever the PodID has not been read by the equipment.

10.4.3.1.3.2 *ID VERIFICATION FAILED* — This is a substate of RETICLE POD ID STATUS and is active when the PodID has verification by the host with the CancelPod service. This is a final state.

10.4.3.1.3.3 *ID VERIFICATION OK* — This is a substate of RETICLE POD ID STATUS and is active as soon as the PodID has been accepted. The ID is determined to be accepted by either successful verification by the equipment or the host, or by bypassing ID read because a PodID reader is not available and the BypassReadID variable is set to true. This is a final state.

10.4.3.1.3.4 *WAITING FOR HOST ON ID STATUS* — This is a substate of RETICLE POD ID STATUS and is active during the period of time when the PodID has been read by the equipment successfully or unsuccessfully and has not yet been verified.

10.4.3.1.4 *RETICLE POD SLOT MAP STATUS* — This is a substate of RETICLE POD and indicates the current status of the reticle pod with respect to its slot map. It has four substates, SLOT MAP NOT READ, WAITING FOR HOST ON SLOT MAP STATUS, SLOT MAP VERIFICATION FAILED, SLOT MAP VERIFICATION OK. The initial default entry sub-state is SLOT MAP NOT READ.

10.4.3.1.4.1 *SLOT MAP NOT READ* — This is a substate of RETICLE POD SLOT MAP STATUS and is the default entry state. It is active when the Reticle Pod is first loaded at the equipment until the Slot Map has been read successfully by the equipment.

10.4.3.1.4.2 *SLOT MAP VERIFICATION FAIL* — This is a substate of RETICLE POD SLOT MAP STATUS and is active when the Slot Map has been read by the equipment and has failed verification by the host. This is a final state.

10.4.3.1.4.3 *SLOT MAP VERIFICATION OK* — This is a substate of RETICLE POD SLOT MAP STATUS and is active as soon as the slot map has been verified. This is a final state.

10.4.3.1.4.4 *WAITING FOR HOST ON SLOT MAP STATUS* — This is a substate of RETICLE POD SLOT MAP STATUS and is active when the equipment is waiting for input from the host.

10.4.4 Reticle Pod State Transition Table

10.4.4.1 Table 7 indicates the triggers and the expected behavior of the instantiated reticle pod object.

Table 7 Reticle Pod State Transition Definition

#	Previous State	Trigger	New State	Actions	Comment
1	(no state)	A reticle pod is instantiated.	RETICLE POD	None.	Data required to be available for this event report: PodID
2	(no state)	<i>Normal:</i> A Bind, ReticleTransferJob or PodNotification service is received.	ID NOT READ	None.	Data required to be available for this event report: PodID
3	(no state)	<i>Normal:</i> A PodID not currently existing at the equipment is successfully read. <i>Abnormal:</i> A PodID is read successfully but an equipment based verification failed.	WAITING FOR HOST ON ID STATUS	None.	Data required to be available for this event report: PodID PortID Normally, this transition will happen after a successful ID read if a bind or ReticleTransferJob service has not been issued (host based verification) or abnormally if a bind or ReticleTransferJob service is followed by a successful ID read and an unsuccessful equipment based verification.
4	(no state)	<i>ID Read fail:</i> A ProceedWithPod service is received.	ID VERIFICATION OK	A reticle pod is instantiated having the PodID provided by the ProceedWithPod service.	Data required to be available for this event report: PodID This transition can happen only if a bind or ReticleTransferJob service has not been received.
5	(no state)	<i>ID Read fail:</i> A CancelPod service is received.	ID VERIFICATION FAIL	A reticle pod is instantiated having the PodID provided by the Cancel Pod service.	Data required to be available for this event report: PodID This transition can happen only if a bind or ReticleTransferJob service has not been received.
6	ID NOT READ	PodID is read successfully and the equipment has verified the PodID successfully.	ID VERIFICATION OK	None.	Data required to be available for this event report: PortID PodID
7	ID NOT READ	PodID is read unsuccessfully.	WAITING FOR HOST ON ID STATUS	None.	Data required to be available for this event report: PortID PodID
8	WAITING FOR HOST ON ID STATUS	A ProceedWithPod service is received.	ID VERIFICATION OK	None.	Data required to be available for this event report: PortID PodID

#	Previous State	Trigger	New State	Actions	Comment
9	WAITING FOR HOST ON ID STATUS	A Cancel Pod Service is received.	ID VERIFICATION FAILED	None.	Data required to be available for this event report: PortID PodID
10	ID NOT READ	BypassReadID _i variable is set to FALSE, and a reticle pod is received when the id reader is not in service or not installed.	WAITING FOR HOST ON ID STATUS	Wait for ProceedWithPod.	Data required to be available for this event report: PortID PodID
11	ID NOT READ	BypassReadID _i variable is set to TRUE, and a reticle pod is received when the id reader is not in service or not installed.	ID VERIFICATION OK	None.	Data required to be available for this event report: PortID PodID
12	ID NOT READ	The equipment successfully reads, but unsuccessfully verifies a reticle PodID.	ID VERIFICATION FAILED	None.	This transition should be followed by the equipment performing a self initiated CancelBind service (see transition 29) Data required to be available for this event report: PodID (of the pod instantiated in the Bind service) Data required to be available for this event report: PortID PodID
13	(no state)	A reticle pod is instantiated.	SLOT MAP NOT READ	None.	No event is required for this transition.
14	SLOT MAP NOT READ	Slot Map is read and verified successfully by the equipment.	SLOT MAP VERIFICATION OK	None.	Data required to be available for this event report: PortID (if valid) PodID LocationID
15	SLOT MAP NOT READ	<i>Normal host based verification:</i> Slot Map is read successfully and the equipment is waiting for host verification. <i>Equipment based verification:</i> Slot map is read successfully but equipment based verification has failed. <i>Slot map read fail:</i> Slot Map cannot be read.	WAITING FOR HOST ON SLOT MAP STATUS	Save new slot map in the SlotMap attribute.	Data required to be available for this event report: PortID (if valid) PodID LocationID SlotMap (if valid) Reason
16	WAITING FOR HOST	A ProceedWithPod service is received.	SLOT MAP VERIFICATION OK	Proceed with the Reticle Pod as instructed.	Data required to be available for this event report: PortID (if valid) PodID LocationID

#	Previous State	Trigger	New State	Actions	Comment
17	WAITING FOR HOST	A CancelPod service is received.	SLOT MAP VERIFICATION FAIL	Prepare the Reticle Pod for Unload.	Data required to be available for this event report: PortID (if valid) PodID LocationID
18	(no state)	A reticle pod object is instantiated.	NOT ACCESSED	None.	Data required to be available for this event report: PodID
19	(no state)	A reticle pod object is instantiated.	NOT AVAILABLE or AVAILABLE	None.	This is the default entry into NOT ACCESSED. If the reticle is instantiated by service, the state is NOT AVAILABLE. If instantiated by PodID read the state is AVAILABLE. Data required to be available for this event report: PodID
20	NOT AVAILABLE	The reticle pod is received by the equipment.	AVAILABLE	None.	Data required to be available for this event report: PodID PortID
21	AVAILABLE	The equipment opens the reticle pod.	IN ACCESS	None.	Data required to be available for this event report: PodID
22	IN ACCESS	<p><i>Normal with ReticleTransferJob service for pod with OutputPortID not equal to zero:</i> The actions defined in the reticle transfer job have completed and the equipment closes the reticle pod.</p> <p><i>PodComplete service:</i> The host sends the PodComplete service and the equipment closes the reticle pod.</p> <p><i>Internal Pod Buffer:</i> The PodOut service has been received.</p> <p><i>Abnormal:</i> The pod has failed slot map verification and/or a CancelPod service is received and the pod is ready for unload.</p>	COMPLETE	None.	Data required to be available for this event report: PodID
23	NOT ACCESSED	<p><i>Via ID verification failure:</i> The pod has failed ID verification and the carrier is ready for unload.</p> <p><i>Via Service:</i> A CancelBind, CancelPodNotification, CancelPod, or CancelReticleTransferJob has been received prior to pod arrival.</p>	COMPLETE	None.	Data required to be available for this event report: PodID

#	Previous State	Trigger	New State	Actions	Comment
24	(no state)	A reticle pod is instantiated.	NOT LOCKED	None.	Data required to be available for this event report: PodID PortID
25	NOT LOCKED	A reticle pod is clamped or otherwise physically restrained from removal by an entity external to equipment.	LOCKED	None.	Data required to be available for this event report: PortID PodID
26	NOT LOCKED	A reticle pod is clamped or otherwise physically restrained from removal by an entity external to equipment.	RELEASED AND LOCKED or HOLD	None.	This is the default entry into LOCKED. If the PodRelease flag is set to Equipment Release the state is RELEASED AND LOCKED. If the PodRelease flag is set to Host Release the state is HOLD. Data required to be available for this event report: PortID PodID
27	HOLD	A PodRelease service has been received by the equipment.	RELEASED AND LOCKED		
28	RELEASED AND LOCKED	<i>MANUAL Access Mode:</i> The POD ACCESSING state enters COMPLETE and a reticle pod is unclamped or has had any restraints preventing removal by an external entity removed. <i>AUTO Access Mode and Unclamp control trigger set to Pod Closed:</i> The POD ACCESSING state enters COMPLETE and a reticle pod is unclamped or has had any restraints preventing removal by an external entity removed. <i>AUTO Access Mode and Unclamp control trigger set to AMHS Triggered Unclamp:</i> The POD ACCESSING state is COMPLETE and the AMHS arrives and starts a PIO sequence.	NOT LOCKED	None.	Data required to be available for this event report: PortID PodID



#	Previous State	Trigger	New State	Actions	Comment
29	POD	<i>Normal:</i> The reticle pod is unloaded from the equipment. <i>Abnormal by service:</i> CancelBind, CancelPodNotification, or CancelReticleTransferJob service is received prior to pod load. <i>Abnormal by equipment:</i> An equipment-based verification fails and the equipment performs a self-initiated CancelBind service.	(no state)	The equipment destroys the instance of this reticle pod object.	Data required to be available for this event report: PodID
30	(no state)	A Reticle Pod is loaded, locked, and the id is read on a load port for which no previous reticle pod has been instantiated.	LOCKED		Data required to be available for this event report: PodID PortID

^{#1} Only one collection event report is required when entering the Reticle Pod State Model (instantiating a reticle pod object). This event report shall include the entry state of all the substates of Reticle Pod State Model, (including RETICLE POD ID STATUS substate, the RETICLE POD SLOT MAP STATUS substate, the RETICLE POD ACCESSING STATUS, and the RETICLE POD LOCKING STATUS).

10.4.5 Slot Map Read Details

10.4.5.1 The Slot Map shall be read on all production equipment prior to removal of reticles from the reticle pod.

10.4.6 *Pod Read Failure* — A pod read failure occurs when the PodID reader is present, in service, and reports that it is unable to read the ID of a pod. This represents a transient random failure rather than a steady condition.

10.4.7 *Bypass Read ID* — A PodID reader may be unavailable: either out of service, not installed, or otherwise malfunctioning and unable to execute a read operation. This represents a steady condition that often is known in advance. The equipment shall provide a user-configurable variable BypassReadID that the user is able to set to specify the action to take when a pod is received to an ASSOCIATED load port. In this case, the reticle pod object is instantiated in the ID NOT READ state, and when the reticle pod is received, the state model transitions to either WAITING FOR HOST or ID VERIFICATION OK, depending upon whether BypassReadID is FALSE (the default value) or TRUE. When TRUE, then the PodID received in the Bind is used automatically. Otherwise, the pod transitions to WAITING FOR HOST and waits for the host to send a ProceedWithPod. The ID used will be the ID included with the ProceedWithPod.

11 Access Mode

11.1 Access Mode State Model

11.1.1 The Access Mode State Model defines the host view of equipment access mode, as well as the host interactions with the equipment necessary to switch the access mode. Each Reticle Load Port has its own Access Mode State Model. There are two access mode states. These are defined in ¶11.3.3.

11.1.2 The access mode for a reticle pod load port may be switched at anytime by the host or the operator, except when the Reticle Load Port Reservation State Model for that Reticle Pod Load Port is in the RESERVED state or during reticle pod transfer. Reticle pod transfer boundaries, for determining when access mode may be changed, are designated by Table 8, Reticle Pod Transfer Boundaries.

Table 8 Reticle Pod Transfer Boundaries

<i>Transfer Type</i>	<i>Transfer Method</i>	<i>Starting Boundary</i>	<i>Ending Boundary</i>
LOAD	MANUAL	This starting boundary is specified by the user. Known examples of the starting boundary include but are not limited to the placement sensor detecting a pod, a pod load port operator access door opening, input to the equipment by the operator through a switch at the load port or the equipment console.	This ending boundary is specified by the user. Known examples of the ending boundary include but are not limited to a preset configurable time following placement sensor detecting a pod, a pod load port operator access door closing, or input to the equipment by the operator through a switch at the load port or the equipment console or a service message.
	AUTO	The PIO Ready signal is active for load.	The PIO signals a transfer complete.
UNLOAD	MANUAL	This starting boundary is specified by the user. Examples of the starting boundary include but are not limited to placement sensor no longer detecting a pod, a pod load port operator access door opening, or input to the equipment by the operator through a switch at the load port or the equipment console or a service message.	This ending boundary is specified by the user. Examples of the ending boundary include but are not limited to a preset configurable time following placement sensor no longer detecting a pod, a pod load port operator access door closing, or input to the equipment by the operator through a switch at the load port or the equipment console or a service message.
	AUTO	The PIO Ready signal is active for unload.	The PIO signals a transfer complete.

11.2 Manual Pod Transfer Confirmation Trigger

11.2.1 For a manual transfer completion confirmation, the production equipment supplier must implement a software or hardware mechanism for an operator to inform the equipment that the pod transfer is complete, but also support methods such as timers that allow equipment to consider a manual transfer complete without operator input.

11.3 Access Mode Initial Value

11.3.1 Also, when equipment re-initialization occurs, the access mode(s) must be remembered, and used as the initial value when initializing. Since the access mode is remembered through re-initializations, the initial value that is used the very first time the software is ever loaded is not important. The equipment supplier is free to set this default value.

11.3.2 Access Mode State Model Diagram

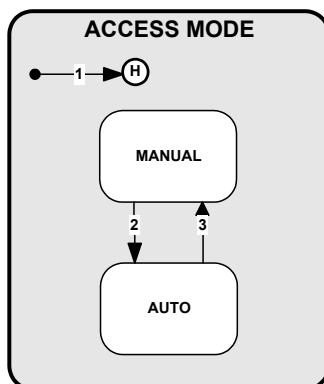


Figure 3
Access Mode State Model Diagram



11.3.3 Access Mode State Definitions

11.3.3.1 *ACCESS MODE* — The parent state for the MANUAL and AUTO sub-states.

11.3.3.2 *MANUAL* — A sub-state of ACCESS MODE. When the production equipment or specified reticle pod load port is in this mode, only manual (non-AMHS) pod transfers are allowed. The production equipment shall have the capability of generating an alarm if an automated (AMHS) delivery is attempted.

11.3.3.3 *AUTO* — A sub-state of ACCESS MODE. When the production equipment or specified reticle pod load ports are in this mode, only automated (AMHS) pod transfers are allowed. The production equipment shall have the capability of generating an alarm if a manual delivery is attempted.

11.3.4 Access Mode State Transition Table

11.3.4.1 Table 9 defines the transitions for the Access Mode State Model.

Table 9 Access Mode State Transition Definitions

#	Previous State	Trigger	New state	Actions	Comments
1	(no state)	System restart.	MANUAL or AUTO (History)	The access mode returns to the mode it was previous to the system reset.	Data required to be available for this event report: PortID
2	MANUAL	The host or operator has executed a ChangeAccess service with the value of AUTO. This trigger can happen at anytime, except during a reticle pod transfer.	AUTO		Manual deliveries are not allowed after this state transition. The operator may also trigger this transaction from the production equipment console. Data required to be available for this event report: PortID
3	AUTO	The host or operator has executed a ChangeAccess service with the value of MANUAL. This trigger can happen at anytime, except during pod transfer.	MANUAL		The operator may also trigger this transaction from the production equipment console or a manual switch at the reticle load port. Automated transfers are not allowed after this state transition. Data required to be available for this event report: PortID

12 Reservation State Model

12.1 The purpose of the Reticle Load Port Reservation State Model is to define the host view of future activity at a specific reticle load port.

12.1.1 The Reticle Load Port Reservation State Model, the ReserveAtPort service and CancelReserveAtPort enable the following items:

1. They enable the host to inform the equipment of a future reticle pod delivery without specifying the reticle PodID and at the same time allow host based verification. (Equipment based verification is enabled via the Load Port/Pod Association State Model, the Bind service, ReticleTransferJob, and the PodNotification service detailed in §13, ¶¶18.4.2, 18.5.19, and 18.4.11.)
2. They enable the equipment to send a state change event to the host if the operator (either local or remote) informs the equipment of a future pod delivery to a reticle load port without specifying the reticle PodID. Thus the host knows that the operator expects to use that reticle load port for something the host did not request for AMHS based delivery.

3. The Bind, ReticleTransferJob, and CancelBind, CancelReticleTransferJob services also trigger changes in the Reticle Load Port Reservation State Model. If the Reticle Load Port Reservation State Model is in the NOT RESERVED state, the Bind or ReticleTransferJob service triggers a transition to the RESERVED state. If the Reticle Load Port Reservation is in the RESERVED State, the CancelBind or CancelReticleTranserJob service triggers a transition to NOT RESERVED.

12.1.2 For Lithography, reticle inspection, and bare reticle stocker equipment, the Reservation State Model, the ReserveAtPort service, the CancelReserveAtPort service, and all other associated functionality is a user option and not necessary for fundamental compliance.

12.1.3 For equipment implementing the reservation state model, the equipment shall provide a reticle load port reservation state model for each load port.

12.2 Reservation Visible Signal

12.2.1 When a port reservation has taken place, the equipment shall display a visible signal indicating that the designated load port is in the Reserved State. Examples of visible signals for the associated load port are: Blinking LEDs, flags, color indicators, or other methods that allow easy recognition that the load port is reserved; proximity to or location on the load port is recommended. The visible signal shall remain present as long as the load port state remains RESERVED. When the state changes to NOT RESERVED the visible indicator shall cease. This capability is not required for fundamental compliance to RPMS.

12.3 Load Port Reservation State Model Diagram

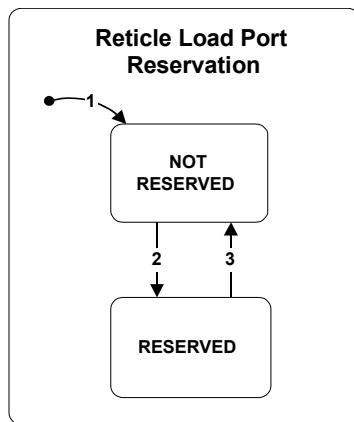


Figure 4
Reticle Load Port Reservation State Model Diagram

12.4 Reticle Load Port Reservation State Definitions

12.4.1 *RETICLE LOAD PORT RESERVATION* — The super state of the substates NOT RESERVED and RESERVED.

12.4.2 *NOT RESERVED* — A substate of LOAD PORT RESERVATION, this state is active when there is no reservation existing at the load port.

12.4.3 *RESERVED* — A substate of LOADPORT RESERVATION, this state is active when there is a reservation for future activity at the load port. When in this state, the access mode for a load port may not be changed.

12.4.4 Reticle Load Port Reservation State Transition Table

Table 10 Reticle Load Port Reservation State Transition Table

#	<i>Previous State</i>	<i>Trigger</i>	<i>New State</i>	<i>Actions</i>	<i>Comments</i>
1	(no state)	System reset.	NOT RESERVED		No event report is required for this transition.
2	NOT RESERVED	<p><i>Service:</i> If reserved by service, the host or operator sends a ReserveAtPort, ReticleTransferJob, or a Bind service to the production equipment.</p> <p><i>PodOut:</i> This happens when the equipment physically initiates a PodOut operation.</p>	RESERVED	<p>If the user has configured the equipment to use the reservation visible signal indicator, it is activated for this load port.</p>	Data required to be available for this event report: PortID PodID may be included when a pod out, ReticleTransferJob or a bind service triggers this transition.
3	RESERVED	<p><i>Service:</i> If a reservation is cancelled by service, the host or operator sends a CancelBind, CancelReticleTransferJob, or a CancelReservationAtPort.</p> <p><i>Pod arrival:</i> A pod arrives at the reserved port.</p>	NOT RESERVED	<p>If the user has configured the equipment to use the reservation visible signal, the indicator is deactivated for this load port.</p>	Data required to be available for this event report: PortID

12.5 Relation of Reservation to Association

12.5.1 The following figure indicates the relationship of Association to Reservation.

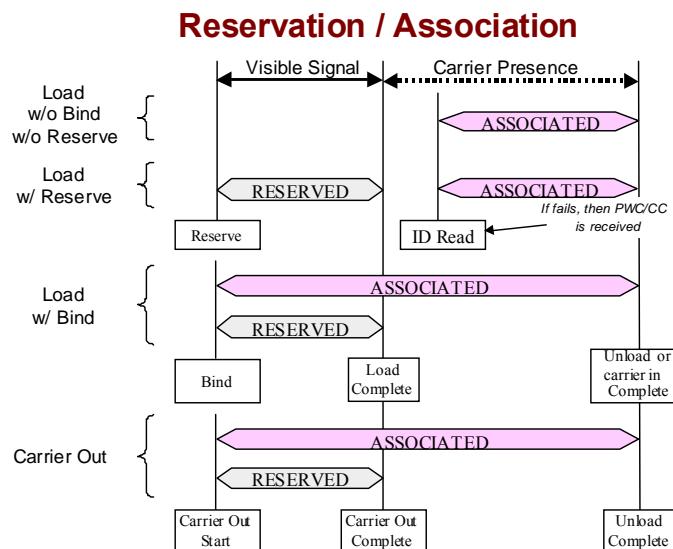


Figure 5
Relation of Reservation to Association

13 Reticle Pod Load Port/Pod Association State Model

13.1 The purpose of the Reticle Pod Association State Model is to define the host view of pod to reticle load port association of the production equipment, as well as the host interactions with the production equipment necessary to associate a reticle pod to a reticle load port, and to perform equipment based pod verification. Each reticle load port shall maintain an independent instance of the Pod Association State Model. Each instance of this state model must not influence the state of the same state model for a different reticle load port.

13.1.1 This state model provides the ability to perform PodID verification with two different methods. If the PodID is provided before the equipment reads the PodID, the PodID that becomes associated with the reticle load port can be used later for equipment based pod verification. If the association happens by PodID read (not by a service execution), then the production equipment shall report the PodID information in a data collection event.

13.2 Reticle Pod Load Port/Pod Association State Model Diagram

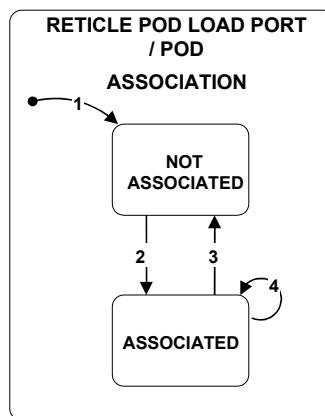


Figure 6
Reticle Pod Load Port/Pod Association State Model Diagram

13.2.1 Reticle Pod Load Port/Pod Association State Definitions

13.2.1.1 *RETICLE POD LOAD PORT/POD ASSOCIATION* — The parent state of the NOT ASSOCIATED and ASSOCIATED sub-states.

13.2.1.2 *NOT ASSOCIATED* — A sub-state of RETICLE POD LOAD PORT/POD ASSOCIATION. There is no pod association present for this load port.

13.2.1.3 *ASSOCIATED* — A sub-state of RETICLE POD LOAD PORT/POD ASSOCIATION. A PodID has been associated with this reticle load port. The reticle pod load port is not available for a new pod association.

13.2.2 Reticle Pod Load Port/Pod Association State Transition Table

13.2.2.1 Table 11 defines the transitions of the Reticle Pod Load Port/Pod Association State Model.

Table 11 Reticle Pod Load Port/Pod Association State Transition Definitions

#	Previous State	Trigger	New State	Actions	Comments
1	(no state)	System reset.	NOT ASSOCIATED		No pod associations exist for reset/re-initialized equipment. Data required to be available for this event report: PortID.

#	Previous State	Trigger	New State	Actions	Comments
2	NOT ASSOCIATED	<p><i>Service:</i> If associated by service, the host sends a Bind or ReticleTransferJob service to the production equipment.</p> <p><i>PodID Read:</i> If associated by a PodID read, the production equipment creates the association at the time the PodID read is performed.</p>	ASSOCIATED		<p>If the Bind or ReticleTransferJob service is performed before the PodID is read by the production equipment, the production equipment can perform the PodID verification. Once the PodID to reticle pod load port association is complete, the reticle pod load port is not available for association until the state returns to NOT ASSOCIATED again.</p> <p>Data required to be available for this event report: PortID PodID</p>
3	ASSOCIATED	<p><i>Service:</i> If an association cancellation is desired, this can be done by the host sending a CancelBind or CancelReticleTransferJob service to the production equipment.</p> <p><i>Reticle Pod Unload:</i> An association cancellation may also be performed by removing the reticle pod from the reticle pod load port.</p>	NOT ASSOCIATED		<p>A reticle pod unload may happen before or after processing occurs. The reticle pod load port is available for another association.</p> <p>Data required to be available for this event report: PortID</p>
4	ASSOCIATED	Production equipment based pod verification fails, and the pod assumes the ID value from the reticle pod that is on the reticle pod load port.	ASSOCIATED	The existing PodID that was associated by a Bind or ReticleTransferJob service is unassociated by the production equipment and the new PodID is now associated to the Reticle Pod Load Port. The production equipment shall delay further action until receiving either a CancelPod or a ProceedWithPod command from the host.	<p>This transition only occurs when the Bind or ReticleTransferJob command has been used.</p> <p>Data required to be available for this event report: PortID PodID</p>

14 Reticle Object

14.1 Information about a reticle is encapsulated as an object. This allows the host to exchange information with the equipment about one or more specific reticle using services defined in SEMI E39, Object Services Standard. A reticle has properties (attributes) that are defined in Table 12, Reticle Attribute Definition.

14.2 Object Instantiation

14.2.1 The reticle object is a software representation of the reticle in the equipment. Under normal circumstances this object is instantiated by the equipment when the host uses the Bind, ReticleTransferJob, PodNotification, ProceedWithPod service (when it included the content map attribute), MoveReticle service, when the equipment



successfully reads the ReticleID from the reticle pod tag, or when the equipment successfully reads the ReticleID from the reticle itself. A reticle is instantiated by reticle pod tag read or ReticleID read only if there are no currently existing objects with the ReticleID just read. A reticle object can also be instantiated by either the ProceedWithPod or CancelPod Services when these services contain the content map. A Reticle can be instantiated by the MoveReticle Service if the ReticleID(s) provided by the service have not been previously instantiated.

14.2.2 From the host point of view, an object is instantiated if the host is able to query the equipment about that object, its current state, and other attributes. Once instantiated, the object is considered destroyed (no longer instantiated) if the response to such queries is “unknown object”.

14.2.3 Summary of possible reticle object instantiation methods:

1. Bind, ReticleTransferJob, or PodNotification Service that contains the content map attribute;
2. PodID tag read containing the content map with no currently existing reticle objects having the ReticleID just read from the pod tag;
3. ReticleID read with no currently existing reticle objects having the ReticleID just read from the ReticleID read;
4. ProceedWithPod or CancelPod Service containing the content map attribute; and
5. MoveReticle Service when the reticle is not previously instantiated.

14.2.4 *Reticle Object Identifier (ObjID)*

14.2.4.1 The purpose of an Object Identifier is to allow references to an object within the system. The object identifier is created when an object is instantiated and should be unchanged or persistent until the end of the object lifecycle. The Object Identifier shall be unique at the equipment during lifecycle of the object. The ReticleID is the Reticle Object Identifier. The equipment is responsible for ensuring uniqueness of the ReticleID prior to instantiation by the bind, PodNotification, ReticleTransferJob, or MoveReticle service.

14.2.5 *Reticle Object Destruction*

14.2.5.1 Normally, the Reticle Object reaches the end of its lifecycle when the reticle pod containing the reticle is unloaded from the equipment. Abnormally, the Reticle Object reaches the end of its lifecycle when a CancelBind, CancelReticleTransferJob, or CancelPodNotification service (if the original Bind, ReticleTransferJob, or PodNotification service contained the contentmap) is executed prior to the reticle pod being loaded, when a CancelMoveReticle service is executed prior to reticle removal from the reticle pod (if the reticle was instantiated using the MoveReticle command), when an equipment based pod verification fails following reticle pod and reticle instantiation by the bind service, ReticleTransferJob, or reticle pod tag read.

14.2.5.2 Summary of reticle object destruction:

1. A reticle pod is unloaded from the equipment;
2. A CancelBind, CancelReticleTransferJob, or CancelPodNotification service that contained the content map is received;
3. An equipment based verification fails (after the object has been instantiated via the bind, ReticleTransferJob service, or reticle pod tag read);
4. A CancelMoveReticle service is executed prior to reticle removal from the reticle pod (when the content map has not been provided by other service or reticle pod tag read); and
5. Manual removal of the physical reticle.

14.3 *Reticle Attribute Definitions*

14.3.1 The following table contains the attributes that are of importance to the host and/or the equipment in order to manage the history and the reports about the reticle object.

14.3.2 *REQD Column*

14.3.2.1 All attributes in the following table are required to be associated with the reticle object. However only the attributes marked with a “Y” in the REQD column are always required to be maintained and updated by the equipment. The attributes marked with an “N” in the REQD column are only required to be maintained if they are



provided by the host by either the Bind, PodNotification, ReticleTransferJob, ProceedWithPod, or MoveReticle Services or if the equipment has means of determining the attribute values. (for example, if the equipment has a ReticleID reader, the equipment can determine the ContentMap).

14.3.3 ACCESS Column

14.3.3.1 Even though a value may be marked as RO (read only), the initial value for the attribute may be provided by the host when attached to either the Bind, PodNotification, ReticleTransferJob or ProceedWithPod services. The only other time the PodCapacityStatus attributes are updated is at the first ProceedWithPod service.

Table 12 Reticle Attribute Definition

<i>Attribute Name</i>	<i>Definition</i>	<i>Access</i>	<i>Reqd</i>	<i>Form</i>
ObjType	Object type.	RO	Y	Text equal to “Reticle”.
ObjID	Object identifier.	RO	Y	Text 1 to 80 characters equal to the ReticleID.
# of Exposures	Count of the number of exposures since the reticle was loaded to the equipment.	RO	Y	Non negative integer.
QualificationInterval-Time	The amount of time (in minutes) allowed between equipment inspections of a reticle. If this time is exceeded, the reticle state must transition to REJECTED.	RW	Y	52
Qualification-TerminationTime	The actual time if when a qualified reticle will expire and the reticle state must transition to rejected.	RO	Y	20
ReticleStatus	Current state of the Reticle.	RO	Y	Enumerated: RETICLE NOT PRESENT, WAITING QUALIFICATION, READING ID, QUALIFIED, IN USE, REJECTED, RETICLE WAITING FOR HOST, PARTICLE INSPECTION.
ReticleAllocationStatus	The current allocation state of the reticle by the equipment. The current substate of the Reticle Allocation state model.	RO	Y	Enumerated: NOT ALLOCATED, ALLOCATED.
ReticleLocationID	The specific location of the reticle.	RO	Y	Enumerated: Equipment dependent text. Example locations: Inspection position, ReticleID read position, storage location 1.
Reticle type	The type of reticle.	RO	Y	Enumerated: Equipment dependent text. Example subtypes: phase shift, binary.

14.4 Reticle State Model

14.4.1 The purpose of the Reticle State Model is to define the host’s view of a reticle. The equipment shall maintain a separate and independent state model for each reticle.

14.4.2 Reticle State Model Diagram

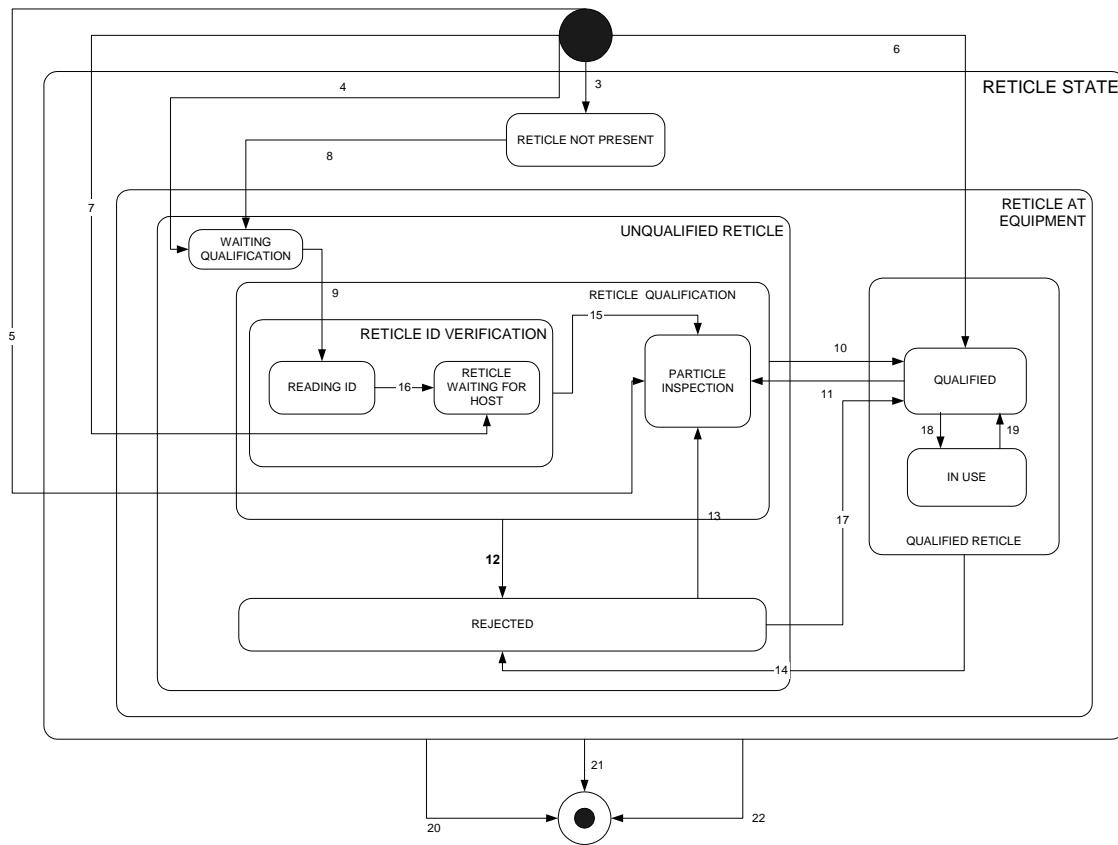


Figure 7
Reticle State Model Diagram

14.4.3 Reticle State Definition

14.4.3.1 *RETICLE NOT PRESENT* — This is a subset of RETICLE STATE and is active when the reticle is not present on the Equipment. The reticle has been instantiated with a Bind, PodNotification, ReticleTransferJob, or MoveReticle service.

14.4.3.2 *RETICLE AT EQUIPMENT* — This is a subset of RETICLE STATE and is active when the reticle is present. The reticle is physically present on the Equipment. There are two substates, UNQUALIFIED RETICLE and QUALIFIED RETICLE.

14.4.3.2.1 *UNQUALIFIED RETICLE* — This is a substate of RETICLE AT EQUIPMENT and is active when the reticle is physically present but not QUALIFIED. There are three substates, WAITING QUALIFICATION, RETICLE QUALIFICATION, AND REJECTED.

14.4.3.2.1.1 *WAITING QUALIFICATION* — This is a substate of UNQUALIFIED RETICLE and is active when the reticle is waiting to be selected for qualification. The physical ReticleID is not read in this state.

14.4.3.2.1.2 *REJECTED* — This is a substate of UNQUALIFIED RETICLE and is active when the reticle did not pass the qualification(s) due to an unexpected ReticleID or poor inspection results. The operator or the host (depending on the control mode) will have to decide if the reticle must be re-qualified or removed from the equipment.

14.4.3.2.1.3 *RETICLE QUALIFICATION* — This is a substate of UNQUALIFIED RETICLE and is active when the reticle is being qualified for production. The ReticleID is being read from the ReticleID and/or a reticle inspection for particles is being performed. There are two substates: RETICLE ID VERIFICATION and PARTICLE INSPECTION.



14.4.3.2.1.3.1 *RETICLE ID VERIFICATION* — This is a substate of RETICLE QUALIFICATION and is active when the reticle ID has not been verified. There are two substates, READING ID and RETICLE WAITING FOR HOST.

14.4.3.2.1.3.1.1 *READING ID* — This is a substate of RETICLE ID VERIFICATION and is active when the Reticle ID is being read.

14.4.3.2.1.3.1.2 *RETICLE WAITING FOR HOST* — This is a substate of RETICLE ID VERIFICATION and is active when the Reticle ID has been read successfully or unsuccessfully and has not yet been verified by the host.

14.4.3.2.1.3.2 *PARTICLE INSPECTION* — This is a substate of RETICLE QUALIFICATION and is active when a reticle is being evaluated for particles.

14.4.3.2.2 *QUALIFIED RETICLE* — This is a substate of RETICLE AT EQUIPMENT and is active when the reticle may be used for production. It has two substates QUALIFIED and IN USE.

14.4.3.2.2.1 *IN USE* — This is a substate of QUALIFIED RETICLE and is active when any kind of processing on the reticle is being done (i.e. the reticle is not at an inventory position).

14.4.3.2.2.2 *QUALIFIED* — This is a substate of QUALIFIED RETICLE and is active when the reticle is at an inventory position, including either the internal reticle buffer or a reticle pod.

14.4.4 *Reticle State Transition Table* — Table 13 indicates the triggers and the expected behavior of the instantiated reticle object.

Table 13 Reticle State Transition Definition

#	Current State	Trigger	New (Sub-)State	Action	Comment
1 This transition is not currently used.	-				
2 This transition is not currently used.	-				
3	(no state)	A reticle is instantiated via the Bind, PodNotification, or ReticleTransferJob, message in which the content map is provided, or the reticle is instantiated via a MoveReticle service for which the Reticle Pod has not been received by the equipment.	RETICLE NOT PRESENT		Data required to be available for this event report: PodID
4	(no state)	A reticle is instantiated after placing a reticle pod on a load port via a reticle PodID tag read that provided the content map or via a MoveReticle service for which the Reticle Pod has been received by the equipment.	WAITING QUALIFICATION	None.	This transition happens only if the content map has not been provided to the equipment prior to reticle pod load port receiving a reticle pod.
5	(no state)	A reticle is instantiated via a ReticleID read and a particle inspection is still required.	PARTICLE INSPECTION		Data required to be available for this event report: ReticleLocationID

#	Current State	Trigger	New (Sub-)State	Action	Comment
6	(no state)	A reticle is instantiated via a ReticleID read and no particle inspection is required.	QUALIFIED		Data required to be available for this event report: ReticleLocationID
7	(no state)	A reticle is instantiated via a reticle ID read and Host based ID verification is required.	RETICLE WAITING FOR HOST		Data required to be available for this event report: ReticleLocationID
8	RETICLE NOT PRESENT	A Reticle Pod load port receives a previously instantiated reticle pod for which the equipment holds the content map attribute.	WAITING QUALIFICATION		
9	WAITING QUALIFICATION	The equipment has begun to qualify a previously instantiated reticle.	READING ID		
10	RETICLE QUALIFICATION	<i>Equipment based:</i> Equipment decides based on preset criteria that a reticle is suited for use. <i>Host based</i> – The equipment receives the ProceedWithReticle Service.	QUALIFIED		Reticle qualification includes both ID verification and quality verification. Reticle is able to be used.
11	QUALIFIED	Host based: The equipment receives a Re-qualify service.	PARTICLE INSPECTION	Start reticle inspection.	
12	RETICLE QUALIFICATION	<i>Equipment based</i> – Equipment determines that an incorrect reticle has been delivered or that a reticle inspection failed. <i>Host based</i> – The equipment receives a RejectReticle service from the host. <i>Operator based</i> – An operator issues a RejectReticle command from the equipment operator interface.	REJECTED		Data required to be available for this event report: ReticleLocationID Reject Reason
13	REJECTED	<i>Host based</i> – The equipment receives a Re-qualify service. <i>Equipment based</i> – A re-inspection is automatically triggered by the Equipment.	PARTICLE INSPECTION	Start reticle inspection.	
14	QUALIFIED RETICLE	<i>Host based</i> - The equipment receives a RejectReticle service from the host. <i>Equipment based</i> -Inspection results of the reticle are expired. <i>Operator based</i> – An operator issues a RejectReticle command from the equipment operator interface.	REJECTED		
15	RETICLE ID VERIFICATION	<i>Equipment based</i> – The reticle ID is verified to be the correct one and a particle inspection is required. <i>Host based</i> – The equipment receives a ProceedWithReticle Service and a particle inspection is required.	PARTICLE INSPECTION		Comment – this transition occurs when particle inspection is needed.

#	Current State	Trigger	New (Sub-)State	Action	Comment
16	READING ID	<i>ID read fail</i> – A reticle ID read fails on a previously instantiated Reticle.	RETICLE WAITING FOR HOST		
17	REJECTED	<i>Host Based</i> – The equipment receives an OktoUseReticle service. <i>Operator based</i> – An Operator issues an OktoUseReticle service from the equipment operator interface.	QUALIFIED		
18	QUALIFIED	<i>For Exposure Equipment</i> : An exposure process has started. <i>For Reticle Inspection Equipment</i> : A Reticle Inspection has started. <i>For Bare Reticle Stockers</i> : A reticle kitting has started.	IN USE		This transition should take place as soon as the needed physical movement of a reticle for processing or inspection has begun.
19	IN USE	<i>For Exposure Equipment</i> : A reticle exposure process has finished. <i>For Reticle Inspection Equipment</i> : An inspection process has finished. <i>For Bare Reticle Stockers</i> — The reticle has been deselected for kitting or kitting has been completed.	QUALIFIED		
20	RETICLE AT EQUIPMENT	Reticle pod containing the reticle is removed from the machine.	-	Delete reticle object.	
21	RETICLE AT EQUIPMENT	Reticle has been manually removed from the equipment.	-	Delete reticle object.	Abnormal situation
22	RETICLE AT EQUIPMENT	<i>Via service</i> : Reticle object has been destroyed via a CancelBind, CancelReticleTransferJob, CancelPodNotification, or CancelMoveReticle service from the host prior to the Reticle being physically read. <i>Via equipment based verification failure</i> : A reticle instantiated via Bind, ReticleTransferJob, PodNotification, Pod Tag read (for a pod tag that holds the contentmap attribute of the pod) or MoveReticle service failed equipment based verification and the equipment destroys the reticle object.	-	Delete reticle object.	Abnormal situation

14.5 Reticle Allocation State Model

14.5.1 The purpose of the Reticle Allocation State Model is to define the host's view of a reticle's allocation state.

14.5.2 Reticle Allocation State Model Diagram

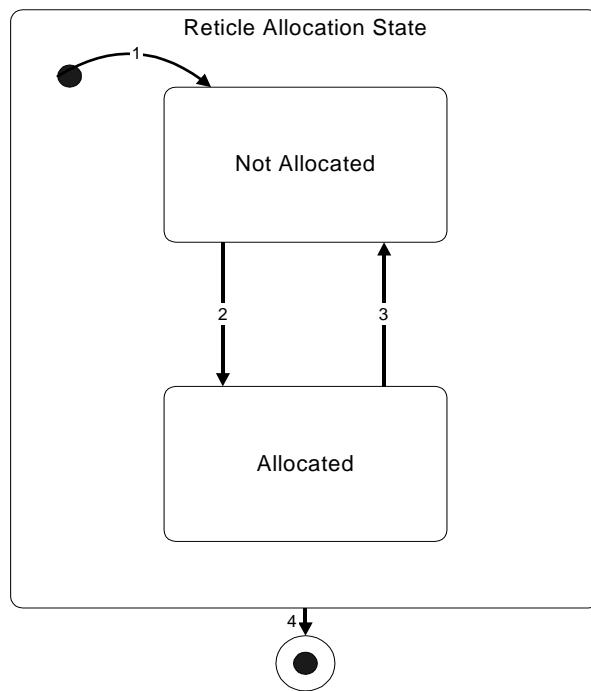


Figure 8
ReticleAllocation State Model Diagram

14.5.3 Reticle Allocation State Definition

14.5.3.1 **RETICLE ALLOCATION STATE** — The super state of NOT ALLOCATED and ALLOCATED.

14.5.3.1.1 **NOT ALLOCATED** — A substate of RETICLE ALLOCATION STATE, this state is active when the reticle is not allocated to a lot in the queue or **not selected for inspection**. For Bare Reticle Stockers – not kitted and not currently selected for kitting.

14.5.3.1.2 **ALLOCATED** — A substate of RETICLE ALLOCATION STATE, this state is active when the reticle is allocated to one or more lots in the queue **or selected for inspection**. For Bare Reticle Stockers – allocated includes being selected for kitting or already kitted.

14.5.4 **Reticle Allocation State Transition Table** — Table 14 indicates the triggers and the expected behavior of the instantiated reticle in regards to the allocation state.

Table 14 Reticle Allocation State Transition Definition

#	Current State	Trigger	New (Sub-) State	Action	Comment
1	-	A reticle is instantiated.	NOT ALLOCATED		
2	NOT ALLOCATED	<i>Production Equipment:</i> The reticle becomes allocated to a pre-processing or processing lot. <i>Inspection Equipment:</i> The reticle becomes allocated to an inspection. <i>Bare Reticle Stocker:</i> The reticle is selected for kitting.	ALLOCATED		



#	Current State	Trigger	New (Sub-) State	Action	Comment
3	ALLOCATED	<p><i>Production Equipment:</i> The last lot allocation to the reticle by a preprocessing or processing lot is removed because this lot has been moved to another state OR the equipment has been restarted.</p> <p><i>Inspection Equipment:</i> The inspection for which the reticle was allocated has been finished or has been cancelled.</p> <p><i>Bare Reticle Stocker:</i> The reticle has been deselected for kitting.</p>	NOT ALLOCATED		
4	RETICLE ALLOCATION STATE	The Reticle object has been destroyed.	-		

15 Verification

15.1 Verification is the operation of comparing an actual value with an expected value. Verification may be performed by either the host or the equipment, depending upon whether the host is using the Bind, ReticleTransferJob, or PodNotification service or not.

15.1.1 If the host provides the expected value before the actual value is obtained by the production equipment, then the production equipment shall perform the verification.

15.1.2 If the host does not provide the expected value before the actual value is read, then the production equipment shall provide to the host, the information necessary for host based verification.

15.1.3 There are three values that are defined by Reticle and Pod Management that require verification: PodID, Pod Slot Map, and ReticleID.

15.2 PodID Verification

15.2.1 Table 15 defines the methods for verifying the PodID.

Table 15 PodID Verification Methods

Verification Method Desired	Host Actions before Load	Equipment Action When Reticle Pod Is Loaded	Host Actions after Load
Production Equipment Based	<p><i>Bind or ReticleTransferJob Service:</i> The host executes the Bind or ReticleTransferJob service to associate a reticle pod load port and a PodID.</p>	<p><i>Bind or ReticleTransferJob Service:</i> The production equipment reads the PodID from the reticle pod, compares it to the podID supplied with the Bind or ReticleTransferJob service.</p>	
		<p><i>Verification Passed:</i> Transition 6 of the Reticle Pod State Model occurs. The production equipment proceeds with processing.</p>	<p><i>Verification Passed:</i> None.</p>

<i>Verification Method Desired</i>	<i>Host Actions before Load</i>	<i>Equipment Action When Reticle Pod Is Loaded</i>	<i>Host Actions after Load</i>
		<i>Verification Failed:</i> The equipment initiates Transition 12 of the reticle pod state model then Transition 29 and the reticle pod object created via the bind or ReticleTransferJob service is destroyed. The equipment also initiates Transition 3 of the reticle pod state model and a reticle pod object with the PodID equal to the one determined by the PodID read is instantiated. The reticle pod shall not be opened by the equipment until and unless the ProceedWithPod service is received from the host.	<i>Verification Failed:</i> The host uses either the CancelPod service to force the reticle pod to be readied for unload, or indicates to the production equipment that it may proceed with the unexpected reticle pod, by sending the ProceedWithPod service. In both cases the PodID specified in the service is equal to the one determined by the PodID read.
	<i>PodNotification Service:</i> The host executes the PodNotification service to inform the equipment of the future arrival of a pod to an unspecified reticle pod load port.	<i>PodNotification Service:</i> The production equipment reads the PodID from the reticle pod, compares it to the PodID supplied with a PodNotification service.	
		<i>Verification Passed:</i> Transition 6 of the Reticle Pod State Model occurs. The production equipment proceeds with processing.	<i>Verification Passed:</i> None.
		<i>Verification Failed:</i> Not Applicable; because there is no association between a reticle pod load port and a reticle pod, equipment based verification failure is not possible. If a reticle pod that has not been instantiated arrives at a load port, the equipment shall consider this as host based verification.	<i>Verification Failed:</i> Not Applicable, because there is no association between a reticle pod load port and a reticle pod, equipment based verification failed is not possible. If a reticle pod that has not been instantiated arrives at a reticle pod load port, the equipment shall consider this as host based verification.” The host will respond with either a ProceedWithPod or a CancelPod Service. (See Host Based verification method).
Host Based	None required, the host may issue a ReserveAtPort service.	The production equipment reads the PodID and reports it to the host in an event report. Following PodID read the equipment initiates Transition 3 of the Reticle Pod State Model and a reticle pod object with the PodID equal to the one determined by the PodID read is instantiated. The reticle pod shall not be opened by the equipment until and unless the ProceedWithPod service is received from the host.	<i>Verification Passed:</i> The host sends a ProceedWithPod service indicating the verification passed.
			<i>Verification Failed:</i> The host uses the CancelPod or CancelPodAtPort service to force the equipment to prepare the pod for unload.



15.3 Slot Map Verification

15.3.1 Table 16 defines the methods for verification of the Reticle Pod Slot Map. Some user's factory operations may not require strict management of the slot map. In this case the user may use the host based verification method.

Table 16 Slot Map Verification Methods

Verification Method Desired	Host Actions Before Verification	Equipment Action When Pod is Loaded	Host Actions After Load
Production Equipment Based	The host provides a Slot Map with the Bind, PodNotification, ReticleTransferJob, or the ProceedWithPod service.	The production equipment checks the reticle pod slot map and compares it to the slot map supplied by the host. Either Transition 14, or 15 of the Pod State Model occurs.	<p><i>Verification Passed:</i> None, the production equipment proceeds with the pod.</p> <p><i>Verification Failed:</i> If the host decides to cancel processing, the host issues the CancelPod service. If the host decides to continue processing, the host issues the ProceedWithPod service.</p>
Host Based	None.	The production equipment checks the reticle pod slot map and reports it to the host in an event report. The host has the responsibility for verifying the slot map.	<p><i>Verification Passed:</i> The host sends a ProceedWithPod indicating the verification passed.</p> <p><i>Verification Failed:</i> If the host decides to cancel processing, the host issues the CancelPod service. If the host decides to continue processing, the host issues the ProceedWithPod service.</p>

15.4 ReticleID Verification

15.4.1 Table 17 below defines the Optional methods for ReticleID verification.

Table 17 ReticleID Verification Methods

Verification Method Desired	Host Actions before Load	Equipment Action When Reticle Pod Is Loaded	Equipment Action when Reticle is removed from cassette	Host Actions after Load
Production Equipment Based	<i>Bind, PodNotification, ReticleTransferJob, or MoveReticle Service prior to Pod Arrival:</i> The host executes a Bind, PodNotification or ReticleTransferJob service that includes the ContentMap and the ReticleIDs.	<i>Bind, PodNotification, ReticleTransferJob Service, or MoveReticle Service prior to Pod Arrival:</i> Transition 8 of the Reticle State Model Occurs (from RETICLE NOT PRESENT to WAITING FOR QUALIFICATION) (E.Ch). The equipment must verify the ReticleID successfully.	Transition 9 of the Reticle State Model occurs. The ReticleID is read.	
			<i>Verification Passed:</i> The equipment may proceed with reticle qualification.	<i>Verification Passed:</i> None.

<i>Verification Method Desired</i>	<i>Host Actions before Load</i>	<i>Equipment Action When Reticle Pod Is Loaded</i>	<i>Equipment Action when Reticle is removed from cassette</i>	<i>Host Actions after Load</i>
			<i>Verification Failed:</i> The equipment initiates Transition 12, then Transition 22 of the reticle state model the reticle object created via the service is destroyed. For the reticle object created via the reticle ID read (the “unexpected reticle”) the reticle is instantiated via transition 7 into the RETICLE WAITING FOR HOST state.	<i>Verification Failed:</i> The host uses either the RejectReticle service to indicate that the equipment should not use the reticle for processing, or indicates to the production equipment that it may proceed with the unexpected reticle, by sending the ProceedWithReticle service. In both cases the ReticleID specified in the service is equal to the one determined by the ReticleID read.
	<i>MoveReticle Service after Pod Arrival prior to reticle instantiation:</i> The host executes a MoveReticle service.	Transition 4 of the Reticle State Model Occurs (from no state to WAITING QUALIFICATION).	Transition 9 of the Reticle State Model occurs. The ReticleID is read.	
			<i>Verification Passed:</i> The equipment may proceed with reticle qualification.	<i>Verification Passed:</i> None.
			<i>Verification Failed:</i> The equipment initiates Transition 12, then Transition 22 of the reticle state model the reticle object created via the service is destroyed. For the reticle object created via the reticle ID read (the “unexpected reticle”) the reticle is instantiated via Transition 7 into the RETICLE WAITING FOR HOST state.	<i>Verification Failed:</i> The host uses either the RejectReticle service to indicate that the equipment should not use the reticle for processing, or indicates to the production equipment that it may proceed with the unexpected reticle, by sending the ProceedWithReticle service. In both cases the ReticleID specified in the service is equal to the one determined by the ReticleID read.
	<i>MoveReticle after pod arrival and reticle instantiation via pod tag read:</i> None	Equipment reads the pod tag and instantiates the reticle object via Transition 4.	Transition 9 of the Reticle State Model occurs. The ReticleID is read.	
			<i>Verification Passed:</i> The equipment may proceed with reticle qualification.	<i>Verification Passed:</i> None.



<i>Verification Method Desired</i>	<i>Host Actions before Load</i>	<i>Equipment Action When Reticle Pod Is Loaded</i>	<i>Equipment Action when Reticle is removed from cassette</i>	<i>Host Actions after Load</i>
			<i>Verification Failed:</i> The equipment initiates Transition 12, the Transition 22 of the reticle state model the reticle object created via the service is destroyed. For the reticle object created via the reticle ID read (the “unexpected reticle”) the reticle is instantiated via Transition 7 into the RETICLE WAITING FOR HOST state.	<i>Verification Failed:</i> The host uses either the RejectReticle service to indicate that the equipment should not use the reticle for processing, or indicates to the production equipment that it may proceed with the unexpected reticle, by sending the ProceedWithReticle service. In both cases the ReticleID specified in the service is equal to the one determined by the ReticleID read.
Host Based	None required, the host may issue a ReserveAtPort service.	The production equipment reads the PodID and reports it to the host in an event report. Following PodID read the equipment initiates Transition 3 of the Reticle Pod State Model and a reticle pod object with the PodID equal to the one determined by the PodID read is instantiated. The reticle pod shall not be opened by the equipment until and unless the ProceedWithPod service is received from the host.	The production equipment reads the ReticleID and reports it to the host in an event report. Following the ReticleID read the equipment initiates Transition 5 (if a particle inspection is required, but reticle ID verification is not) or Transition 6 (if neither a reticle ID verification nor a particle inspection is required), or Transition 7 (if an ID verification is required) of the Reticle State Model and a reticle object determined by the ReticleID read is instantiated.	<i>Verification Passed:</i> The host sends a ProceedWithReticle service indicating the verification passed. The equipment may proceed with reticle qualification.
				<i>Verification Failed:</i> The host uses the RejectReticle service to indicate that the equipment should not use the reticle for processing.
	ProceedWithPod after Pod arrival, includes Content Map: None	Equipment Reads the Pod, reports ID. After receiving ProceedWithPod with a ContentMap, the Reticle is instantiated via Transition 4.	Transition 9 of the Reticle State model occurs. The Reticle ID is read.	
			<i>Verification Passed:</i> The equipment may proceed with reticle verification.	<i>Verification Passed:</i> None

<i>Verification Method Desired</i>	<i>Host Actions before Load</i>	<i>Equipment Action When Reticle Pod Is Loaded</i>	<i>Equipment Action when Reticle is removed from cassette</i>	<i>Host Actions after Load</i>
			<i>Verification Failed:</i> The Equipment initiates Transition 12, then Transition 22 of the reticle state model; the reticle created via the service is destroyed. For the reticle created via the ID Read (the “unexpected reticle”), the reticle is created via Transition 7 into the RETICLE WAITING FOR HOST state.	<i>Verification Failed:</i> The host uses either the RejectReticle service to indicate that the equipment should not use the reticle for processing or indicates to the equipment that it may proceed with the unexpected reticle, by sending the ProceedWithReticle service. In both cases the ReticleID specified in the service is equal to the one determined by the ReticleID read.

15.5 Table 18 clarifies the relation of the reservation and verification to the related services.

Table 18 Reservation and Verification Relation to Service

	<i>Reser-vation</i>	<i>PodID Verification</i>	<i>Cassette SlotMap Verification</i>	<i>ReticleID Verification</i>	<i>Service Used</i>	<i>Information Provided with Service</i>			
						<i>Port ID</i>	<i>PodID</i>	<i>SlotMa-p</i>	<i>Content Map and ReticleID</i>
1	Yes	Equipment based	Equipment based	Equipment based	Bind, or ReticleTransferJob	Yes	Yes	Yes	Yes
2	Yes	Equipment based	Host based	Host based	Bind	Yes	Yes	No	No
3	Yes	Host based	Host based	Host based	ReserveAtPort	Yes	No	No	No
					ProceedWithPod (following ID read and host verification)	No	Yes	No	No
4	Yes	Host based	Equipment based	Host based	ReserveAtPort	Yes	No	No	No
					ProceedWithPod to provide slotmap (following ID read and host verification)	No	Yes	Yes	No
5	No	Equipment based	Equipment based	Equipment based	PodNotification	No	Yes	Yes	Yes
6	No	Equipment based	Host based	Host based	PodNotification	No	Yes	No	No
7	No	Host based	Equipment based	Host based	ProceedWithPod to provide slotmap (following ID read and host verification)	No	Yes	Yes	No
8	No	Host based	Host based		ProceedWithPod (following ID read and host verification)	No	Yes	No	

16 Reticle Pod Release Control

16.1 For equipment, where Pod Read/Write technology is used and the Host initiates writing, the reticle pod or reticle cassette must remain at the write position where the tag may be accurately written on until the Host has completed its entire read and write operations. For this purpose, a variable that affects the equipment releasing a pod is defined.

16.2 *Pod Hold Trigger* — Equipment shall allow the user to select a trigger to release the carrier pod when reading/writing is complete. Release does not mean the equipment must move the pod from the location it currently occupies, only that it is permissible to do so.

16.2.1 *Pod Hold Trigger set to Host Release* — If the Pod Hold trigger is set to Host Release, equipment shall hold the pod at the write position until the PodRelease service is received.

16.2.2 *PodHold Trigger set to Equipment Release* — If the Pod Hold trigger is set to Equipment Release, the equipment shall release the reticle pod based on the when the equipment has finished removing all reticles from the pod, finished placing all reticles in the pod, and in the case where the equipment initiates writing until the equipment has finished writing.

16.3 Fixed Buffer Equipment shall allow the user to select a trigger to unclamp the reticle pod based on AMHS arrival at the equipment. If the access mode is MANUAL, the unclamp control trigger has no effect.

16.3.1 *UnclampControl trigger set to PODCOMPLETE Triggered Unclamp* — The equipment automatically unclamps the reticle pod when the reticle pod status is COMPLETE.

16.3.2 *UnclampControl trigger set to AMHS Triggered Unclamp* — The equipment behavior depends upon the Reticle Load Port Access State. If the Reticle Pod Load port Access State is AUTO, the reticle pod remains clamped until AMHS has arrived. The AMHS arrives and begins a PIO unload sequence.

17 Reticle Location Object Definition

17.1 A Reticle Location Object (RLO) provides a model for identifying reticle locations. Each RLO on an equipment is assigned a reticle location ID to uniquely identify it. The assignment shall be documented by the equipment supplier. There are two types of substrate locations: reticle pod reticle location, which is the location or position (e.g., slot) in the reticle pod, and equipment reticle location, which is on the equipment resource. The equipment reticle location is a persistent object, while the reticle pod reticle locations are dynamic objects that shall be created or deleted by the placement or removal of reticle pods on the equipment. The intent is to follow E90 in regards to location object management. The reticle location object is a subtype of the substrate location object.

17.1.1 Source reticle locations and Destination reticle locations are the points at which reticles transfer to/from the equipment's internal reticle locations (often locations at which processing occurs). A reticle pod reticle location is the Source or Destination reticle location when a pod is used to transfer the reticle. An equipment reticle location can be the Source or Destination reticle location when the reticle is transferred directly (without a pod).

17.2 *Reticle Location State Model* — Figure 9 below shows the dynamic behavior of the reticle location using the Harel state chart representation.

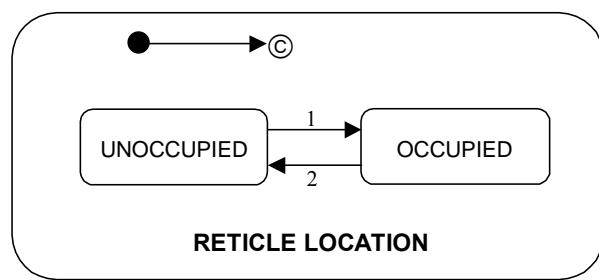


Figure 9
Reticle Location State Model Diagram



17.3 Reticle Location State Definitions

17.3.1 *RETICLE LOCATION* — the superstate of UNOCCUPIED and OCCUPIED.

17.3.2 *UNOCCUPIED* — the state in which the reticle location does not hold or have a reticle.

17.3.3 *OCCUPIED* — the state in which the reticle location holds a reticle.

17.4 Substrate Location State Transition

Table 19 Reticle Location State Model Transition Table

#	Current State	Trigger	New State	Action	Comment
1	UNOCCUPIED	Reticle moves onto the substrate location.	OCCUPIED	None.	Data required to be available for this event: ReticleID
2	OCCUPIED	Reticle moves off the location.	UNOCCUPIED	Update reticle tracking history.	Data required to be available for this event: ReticleID

17.5 Reticle Location Object Attributes

17.5.1 Table 20 defines attributes for Reticle location objects. These attributes can be accessed by using GetAttr and SetAttr messages as defined in SEMI E39 (OSS).

Table 20 Reticle Location Object Attribute Table

Attribute Name	Definition	Access	Reqmt	Format
ObjID	Object Identifier	RO	Y	Text equal to the Reticle Location ID
ObjType	Object type	RO	Y	Text = “ReticleLoc”
ReticleID	Reticle IDentifier relevant to the location	RO	Y	Text
ReticleLocation-State	Reticle Location state	RO	Y	Enumerated: UNOCCUPIED OCCUPIED

18 Services

18.1 The purpose of this section is to define the message services required to support Reticle Management functionality.

18.1.1 This message service definition has four parts:

- A service description table.
- A service parameter table.
- A service parameter value table that specifies the type and range of the parameters.
- A service state mapping table that defines the states in which each service is valid.

18.2 Service Message Description

18.2.1 There are two types of services:

- An initial message and response between the service user and the service provider.
- A notification message from the service provider to the service user that does not require a response.

18.2.2 The “TYPE” column in the following table is used to indicate whether the service consists of a request/response message pair, “R”, or a single notification message, “N”.



18.2.3 The “Requirement” level column in the following table is used to indicate whether the service is a fundamental requirement, “F”, or an additional capability “A” for RPMS.

Table 21 Service Message Description

<i>Service Name</i>	<i>Type</i>	<i>Requirement level</i>	<i>Description</i>
Bind	R	F	This service shall associate a PodID to a load port and shall cause the load port to transition to the RESERVED state.
CancelAllPodOut	R	A	This service shall cause all PodOut services to be removed from the queue.
CancelBind	R	F	This service cancels a PodID to load port association and shall cause the load port to transition to the NOT RESERVED state.
CancelMoveReticle	R	A	This service cancels a prior MoveReticle service provided that MoveReticle service has not been started.
CancelPod	R	F	This service shall Cancel the current pod related action, and the production equipment shall return the pod to the unload position of the load port, or an internal buffer position, depending on the pod’s position in the production equipment.
CancelPodAtPort	R	F	This service shall Cancel the current pod related action, and the production equipment shall return the pod to the unload position of the load port.
CancelPodNotification	R	F	This service shall cause the equipment to destroy a pod object instantiated through a prior PodNotification.
CancelPodOut	R	A	This service shall cause a specified PodOut service to be removed from the queue by the production equipment.
CancelReservation-AtPort	R	F	This service shall cause the equipment to remove the reservation at the specified Port and to deactivate the visible signal.
CancelReticle-TransferJob	R	A	The service cancels a reticle PodID to load port associations and shall cause the load port to transition to the NOT RESERVED state. Also it shall cause the equipment to refrain from removing the reticles from the reticle pod specified in a previous ReticleTransferJob service. Finally it shall cause the equipment to refrain from removing the reticles from the equipment specified in the same previous ReticleTransferJob service.
ChangeAccess	R	F	This service shall change the access mode of the specified Ports at the production equipment. If a load port is dedicated to either Automated delivery or Manual delivery, the access mode cannot be changed.
ChangeServiceStatus	R	F	This service shall change the transfer status of a specified load port at the production equipment.
Clamp	R	A	This service shall cause the equipment to engage any clamping mechanisms that are independent of opening the pod.
ClosePod	R	A	This service shall cause the equipment to close the pod.
IndexDown	R	A	This service shall cause the equipment to index the cassette down when it is safe for equipment, operators, and reticles to do so.
IndexUp	R	A	This service shall cause the equipment to index the cassette up when it is safe for equipment, operators, and reticles to do so.
MoveReticle	R	A	This service shall cause the equipment to move a reticle from one position to another either internal to internal, internal to external, external to internal, or external to external.
OktoUseReticle	R	F	This service shall change the RETICLE AT EQUIPMENT status of the specified reticle to QUALIFIED.
OpenPod	R	A	This service shall cause the equipment to open the pod.
PodComplete	R	F	This service shall change the reticle pod accessing status to COMPLETE.

<i>Service Name</i>	<i>Type</i>	<i>Requirement level</i>	<i>Description</i>
PodIn	R	A	This service shall cause a pod to be moved from a load port to an internal buffer location. Used in anomaly situations.
PodNotification	R	F	This service shall cause the equipment to instantiate a pod object.
PodOut	R	A	This service shall cause a pod to be moved from the internal buffer to a load port. This service can be queued by the production equipment.
PodRelease	R	A	Release the pod from Pod Hold.
PodTagReadData	R	A	Read data from PodID tag.
PodTagWriteData	R	A	Write data to the PodID tag.
ProceedWithPod	R	F	This service shall instruct the production equipment to proceed with using the specified pod.
ProceedWithReticle	R	F	This service is used to change the state of the reticle from RETICLE ID VERIFICATION to PARTICLE INSPECTION when particle inspection is required and from RETICLE ID VERIFICATION to QUALIFIED when particle inspection is not required ^{#1} .
RejectReticle	R	F	This service shall cause the equipment to change the RETICLE AT EQUIPMENT state to REJECTED.
Re-qualifyReticle	R	A	This service shall cause the equipment to reinspect the reticle.
ReserveAtPort	R	F	This service shall cause the equipment to reserve the specified Port and activate a visible signal. This service is a possible transfer boundary.
ReticleTransferJob	R	A	This service shall associate a PodID to a load port and shall cause the load port to transition to the RESERVED state. It will also cause the equipment to begin removal, identification, and qualification of specific reticles in the pod as well as placement of specific reticles into the pod upon pod arrival and verification.
SetQualification-IntervalTime	R	A	This service shall set the maximum interval time between reticle inspections.
Unclamp	R	A	This service shall cause the equipment to release any clamping mechanisms that prevent removal of the pod. The pod must be closed prior to execution of this service.

^{#1} Normally this transition would be from the substate of RETICLE ID VERIFICATION, RETICLE WAITING FOR HOST.

18.3 Service Message Parameter Definition

18.3.1 The following is a list of required parameters used in conjunction with service messages.

Table 22 Service Message Parameter Definition

<i>Parameter Name</i>	<i>Form</i>	<i>Description</i>
AccessMode	Enumerated AUTO, MANUAL.	The desired access mode of the ports specified.



<i>Parameter Name</i>	<i>Form</i>	<i>Description</i>
ArrivingReticleList	Ordered list of ReticleID, ReticlePropertiesList, and removal instructions corresponding to the slot number.	Ordered List of n structures where n is equal to the value of the pod attribute "Capacity," and each structure consists of a ReticleID, a ReticlePropertiesList, and an enumerated removal instruction. List of structure ReticleID ReticlePropertiesList Enumerated Enumerated: REMOVE PASS BY
AttributeData	Could be several different data types.	The data value associated with AttributeID.
AttributeID	Text 1–40 characters.	The ID of the object attribute in a PropertiesList.
PodID	Text 1–64 characters.	ID number of a pod.
Qualification-IntervalTime	U2.	The time in minutes allowed between equipment inspections of a reticle.
RPMAcknowledge	Enumerated: <ul style="list-style-type: none">• Acknowledge, service has been performed• Service does not exist• Cannot perform now• At least parameter is invalid• Acknowledge, service will be performed with completion notified later with parameters for response• No such object exists	Acknowledgement of request.
RPMStatus	A structure consisting of RPMAcknowledge and Status.	Return information for a service.
Data	Text.	User data.
DataSeg	Protocol-specific.	Indicates specific section of data to read or write.
DataSize	Unsigned integer.	Indicates the number of bytes of data to read or write.
DepartingReticleList	Ordered list of ReticleID and instructions to remove from the equipment and place in the reticle cassette corresponding to the slot number of the cassette to which the reticle will be placed.	Ordered List of n structures where n is equal to the value of the pod attribute "Capacity," and each structure consists of a ReticleID and an enumerated instruction. List of structure ReticleID Enumerated Enumerated: CURRENTLY OCCUPIED PLACE PASS BY When no reticle is targeted to be placed in a slot, the ReticleID should be null. When the enumeration is equal to CURRENTLY OCCUPIED or PASS BY the ReticleID should be null.
DestinationLocation	LocationID.	The location for which a reticle is to be moved.

<i>Parameter Name</i>	<i>Form</i>	<i>Description</i>
ErrorCode	Enumerated: <i>Valid for all services listed below</i> Unsupported option [service] requested Command not valid for current state Insufficient parameters specified Parameters improperly specified <i>Bind</i> Load port does not exist Object identifier already in use Invalid attribute value Unknown attribute name <i>CancelAllPodOut</i> (none) <i>CancelBind</i> Load port does not exist Unknown object instance <i>CancelPod</i> Load port does not exist Unknown object instance <i>CancelPodAtPort</i> Load port does not exist <i>CancelPodNotification</i> Unknown object instance <i>CancelPodOut</i> Unknown object instance <i>CancelReservationAtPort</i> Load port does not exist <i>PodIn</i> Unknown object instance <i>PodNotification</i> Object identifier already in use Invalid attribute value Unknown attribute name <i>PodOut</i> Load port does not exist Unknown object instance <i>ChangeAccess</i> Load port does not exist <i>ChangeServiceStatus</i> Load port does not exist <i>ProceedWithPod</i> Load port does not exist Unknown object instance Invalid attribute value Unknown attribute name <i>ReserveAtPort</i> Load port does not exist	Contains the code for the specific error found.
ErrorText	Text.	Text in support of the error code.
InputPortID	Integer 0, 101–255.	ID number of the load port where the Pod will be delivered. The InputPortID number should be the same as the load port number. When the value of the InputPortID = zero, the Pod will be picked up from the internal buffer.

<i>Parameter Name</i>	<i>Form</i>	<i>Description</i>
OutputPortID	Integer 0, 101 to 255.	ID number of a load port where the Pod will be presented for removal. The OutputPortID number should be the same as the load port number. When the value of the OutputPortID = zero, the Pod will be delivered to the internal buffer.
PortID	Integer 1-n.	ID number of a load port. The PortID number should be the same as the load port number.
PortList	List 1-n items.	List of n items PortID ₁ . . n PortID _n
PodPropertiesList	List 1-n name/value pairs.	List of n items 1. AttributeID ₁ AttributeData ₁ . . n. AttributeID _n AttributeData _n
ReticlePlacement-Instruction	Enumerated: 0 = PLACE 1 = PASS BY 2 = CURRENTLY OCCUPIED	The instructions for placing reticles in pod slot.
ReticlePropertiesList	List 1-n name/value pairs.	List of n items 1. AttributeID ₁ AttributeData ₁ . . n. AttributeID _n AttributeData _n
ReticleLocation-PropertiesList	List 1-n name/value pairs.	List of n items 1. AttributeID ₁ AttributeData ₁ . . n. AttributeID _n AttributeData _n
ReticleRemoval-Instruction	Enumerated: 0 = REMOVE 1 = PASS BY	The instructions for removing reticles from a pod slot.
ServiceStatus	Enumerated: IN SERVICE, or OUT OF SERVICE.	The desired transfer service status of the specified load port.
SourceLocation	LocationID.	The source location from which to move a reticle.
Status	A list of ErrorCode/ErrorText pairs.	Reports any errors found.

18.4 Fundamental Service Message Definitions

18.4.1 The following tables specify the allowable/required parameters for each service. The column marked "REQ/OPT", specifies which parameters are required to be supported for RPMS compliance (R = Required, O = Optional).



18.4.2 *Bind*

18.4.2.1 The Bind service is used to associate a PodID with a load port. The Bind can contain a PropertiesList of pod object attributes that are supplied by the host. A pod object is instantiated when this service is used successfully. The Bind service will be rejected if the pod specified has already been instantiated through the Bind or PodNotification service, or a PodID read. The Bind service also triggers a transition in the Load Port Reservation state model from NOT RESERVED to RESERVED.

Table 23 Bind Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	The PortID where a pod is expected.
PodID	M	—	The expected PodID.
PodPropertiesList	C	—	A list of name value pairs providing attributes for the pod object being instantiated with the Bind service.
CMStatus	—	M	Information concerning the result of the service.

18.4.3 *CancelBind*

18.4.3.1 The CancelBind request is used to cancel the association between a port and a PodID. The pod object is destroyed when this service is used successfully. The CancelBind service also triggers a transition in the Load Port Reservation state model from RESERVED to NOT RESERVED.

Table 24 CancelBind Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	C	—	The PortID for which to cancel the load port to pod association. Either PortID or PodID must be specified.
PodID	C	—	The PodID for which to cancel the load port to pod association. Either PortID or PodID must be specified.
CMStatus	—	M	Information concerning the result of the service.

18.4.4 *CancelPod*

18.4.4.1 The CancelPod request is used to stop a reticle pod. If the reticle pod is at a reticle pod load port, then it shall be made ready for unload. The production equipment shall reject this service if issued after reticles have been removed for processing.

Table 25 CancelPod Service Parameters

Parameter Name	Req/Opt	Rsp/Conf	Description
PodID	M	—	The PodID to cancel.
CMStatus	—	M	Information concerning the result of the service.
PortID	C	—	The PortID where the pod object is located. This parameter is not required if the pod object has been previously instantiated.

18.4.5 *CancelPodAtPort*

18.4.5.1 CancelPodAtPort is used to abort any pod at a designated port. This service can be used when the podID of the pod at the designated port is unknown.



Table 26 CancelPodAtPort Service Parameters

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	Any pod that exists on the load port specified shall be made ready for unloading.
CMStatus	—	M	Information concerning the result of the service.

18.4.6 *CancelPodNotification*

18.4.6.1 The CancelPodNotification is used by the host to request the equipment cancel a previous PodNotification service. This service shall cause the equipment to destroy the pod object specified.

Table 27 CancelPodNotification Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	M	—	The PodID of the pod object to destroy.
CMStatus	—	M	Information concerning the result of the service.

18.4.7 *ChangeAccess*

18.4.7.1 The ChangeAccess message requests a change of access mode for the load ports specified in the PortList.

Table 28 ChangeAccess Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
AccessMode	M	—	The new desired access mode.
PortList	C	—	The list of ports to use the new access mode.
CMStatus	—	M	Information concerning the result of the service.

18.4.8 *ChangeServiceStatus*

18.4.8.1 The ChangeServiceStatus service is used to request the production equipment change a load port service state.

Table 29 ChangeServiceStatus Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	PortID to designate the new service status.
ServiceStatus	M	—	The new service state.
CMStatus	—	M	Information concerning the result of the service.

18.4.9 *OktoUseReticle*

18.4.9.1 The OktoUseReticle service is sent by the host to indicate that the reticle may be used for processing. The equipment should change the reticle state model RETICLE AT EQUIPMENT status to QUALIFIED.

Table 30 OktoUseReticle Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
ReticleID	M	—	ReticleID to designate the RETICLE AT EQUIPMENT status.
RPMStatus	—	M	Information concerning the result of the service.



18.4.10 *PodComplete*

18.4.10.1 The PodComplete service is used by the host to inform the equipment that all actions for transferring reticles in and out of the pod are complete. This service is used when the equipment has not previously received a ReticleTransferJob service for the pod. This service may also be used in the event of a Reticle Transfer Job that is not completed successfully.

Table 31 PodComplete Parameters

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	M	—	The PodID of the Pod that is complete.
PortID	C	—	The Port ID the Pod currently occupies.
CMStatus	—	M	Information concerning the result of the service.

18.4.11 *PodNotification*

18.4.11.1 The PodNotification service is used by the host to inform the equipment that a Pod with the ID specified will be arriving at the equipment. The load port is not specified; therefore no pod to load port association takes place. A pod object with the ObjID equal to the PodID specified in the service is instantiated. The PodNotification service will be rejected if the pod specified has already been instantiated through the Bind or PodNotification service, or a PodID read.

Table 32 PodNotification Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	M	—	The PodID of the pod object to instantiate.
PodPropertiesList	C	—	The PropertiesList of the pod to instantiate.
CMStatus	—	M	Information concerning the result of the service.

18.4.12 *ProceedWithPod*

18.4.12.1 The ProceedWithPod service is sent by the host to indicate that the pod operations may continue. When using host based verification it is used by the host to indicate to the production equipment that the verification of PodID and/or the Cassette Slot Map is correct. For successful production equipment based verification the production equipment shall not require this message before proceeding with the pod. For failed production equipment based verification the production equipment shall require either a CancelPod or ProceedWithPod service.

18.4.12.2 Using Table 33, for the Host based PodID verification case, the ProceedWithPod service sent by the host after the first PodID read is referred to as ProceedWithPod #1, the ProceedWithPod service sent after slot map read is referred to as ProceedWithPod #2.

Table 33 ProceedWithPod Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	C	—	The PortID for which processing may proceed.
PodID	M	—	The PodID for which processing may proceed.
PodPropertiesList	C	—	A list of name value pairs providing attributes for the pod object.
CMStatus	—	M	Information concerning the result of the service.



18.4.13 *ProceedWithReticle*

18.4.13.1 The ProceedWithReticle service is sent by the host to indicate that reticle operations may continue. In particular and in the normal case, this service is used to change a Reticle, in the RETICLE WAITING FOR HOST state from RETICLE WAITING FOR HOST to PARTICLE INSPECTION when particle inspection is required, and from RETICLE WAITING FOR HOST to QUALIFIED if particle inspection is not required.

Table 34 ProceedWithReticle Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
ReticleID	M	—	The ID of the reticle for which to change the UNQUALIFIED RETICLE status.
Reticle Location ID	C	—	The location of the reticle.
RPMStatus	—	M	Information concerning the result of the service.

18.4.14 *RejectReticle*

18.4.14.1 The RejectReticle service is sent by the host to indicate that the reticle may no longer be used for processing, unless it is requalified. The equipment shall change the reticle state model RETICLE AT EQUIPMENT status to REJECTED.

Table 35 RejectReticle Service Parameter Definition

Parameter Name	Req/Ind	Rsp/Conf	Description
ReticleID	M	—	ReticleID to designate the RETICLE AT EQUIPMENT status.
RPMStatus	—	M	Information concerning the result of the service.

18.4.15 *SetQualificationIntervalTime*

18.4.15.1 The SetQualificationIntervalTime service is sent by the host to change the time between inspection for a specific or a list of specific reticles. This service uses SETATTR as defined in SEMI E39.

18.5 Additional Service Message Definitions

18.5.1 *CancelAllPodOut*

18.5.1.1 The CancelAllPodOut service is sent to internal buffer production equipment to cancel all PodOut services in queue.

Table 36 CancelAllPodOut Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
CMStatus	—	M	Information concerning the result of the service.

18.5.2 *CancelMoveReticle*

18.5.2.1 The CancelMoveReticle service is sent by the host to cancel a MoveReticle service. The equipment shall refrain from removing the reticle specified. This shall apply on if the move has not been started.

Table 37 CancelMoveReticle

Parameter Name	Req/Ind	Rsp/Conf	Description
ReticleID	M	—	The ReticleID which should not be removed.
RPMStatus	—	M	Information concerning the result of the service.



18.5.3 *CancelPodOut*

18.5.3.1 The CancelPodOut service is sent to internal buffer production equipment to cancel a queued PodOut.

Table 38 CancelPodOut Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	M	—	PodID for the PodOut service that is being cancelled.
CMStatus	—	M	Information concerning the result of the service.

18.5.4 *CancelReservationAtPort*

18.5.4.1 The CancelReservationAtPort service is sent by the host to cancel a reservation at the load port. The load port will enter the UNRESERVED State after receiving this service. A Port reserved by the physical initiation of a pod out operation may not be cancelled by this service.

Table 39 CancelReservationAtPort Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	The Port ID to reserve.
CMStatus	—	M	Information concerning the result of the service.

18.5.5 *CancelReticleTransferJob*

18.5.5.1 The CancelReticleTransferJob is sent by the host to cancel a previous ReticleTransferJob service.

Table 40 CancelReticleTransferJob Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	M	—	The PodID of the pod for which to cancel the load port to pod association.
PortID	M	—	The Port ID for which to cancel the load port to pod association.
OutputPortID	M	—	The Port ID where the pod was to have been delivered after having executed all reticle related actions.
RPMStatus	—	M	Information concerning the result of the service.

18.5.6 *Clamp*

18.5.6.1 The Clamp service is used by the host if the equipment has separate mechanisms for clamping the carrier that are independent of opening the carrier. It is used to instruct equipment to engage the independent clamping mechanism. It is used by the host when “macro” instructions such as provided by Bind, PodNotification, ProceedWithPod and ReticleTransferJob have not been provided.

Table 41 Clamp Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	C	—	The PodID of the pod to clamp. Either the PodID or the PortID must be specified.
PortID	C	—	The PortID for which to clamp a carrier. Either the PodID or the PortID must be specified.
CMStatus	—	M	Information concerning the result of the service.



18.5.7 Close Pod

18.5.7.1 The ClosePod service is used by the host to request the equipment close a pod.

Table 42 ClosePod Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	C	—	The PortID where a pod is to be closed. Either PortID or PodID must be specified.
PodID	C	—	The PodID for which the door should be closed. Either PortID or PodID must be specified.
CMStatus	—	M	Information concerning the result of the service.

18.5.8 IndexDown

18.5.8.1 The IndexDown service is sent by the host to indicate that the equipment should index the reticle cassette to the position where reticle may be removed from the cassette when it is safe for equipment, personnel, and reticles to do so.

Table 43 IndexDown Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	PortID to designate the new service status.
PodID	C	—	The ID of the pod to index down.
CMStatus	—	M	Information concerning the result of the service.

18.5.9 IndexUp

18.5.9.1 The IndexUp service is sent by the host to indicate that the equipment should index the reticle cassette to the position where the reticle pod may be removed from the equipment when it is safe for equipment, personnel, and reticles to do so. This service is optional.

Table 44 IndexUp Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	PortID to designate the new service status.
PodID	C	—	The ID of the pod to index up.
CMStatus	—	M	Information concerning the result of the service.

18.5.10 MoveReticle

18.5.10.1 The MoveReticle service is used to move reticles from one reticle location to another. This can include moving a reticle from a reticle pod location (external to a tool) to an internal reticle library, ReticleID read location, process location, or a different reticle pod location or from an internal location to another internal location or to a reticle pod location.

Table 45 MoveReticle Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PortID	M	—	PortID to designate the new service status.
ReticleID	C	—	The ID of the Reticle to move, either the ReticleID or the SourceLocation must be used.

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
SourceLocation	C	—	The ReticleLocationID of the location from which to move the reticle, either the SourceLocation or the ReticleID must be used.
Destination-Location	M	—	The ReticleLocationID of the location to which the reticle shall move.
RPMStatus	—	M	Information concerning the result of the service.

18.5.11 *OpenPod*

18.5.11.1 The OpenPod service is used by the host to request the equipment open a pod

Table 46 OpenPod Service Parameter Definitions

<i>Paramter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
PortID	C	—	The PortID where a pod is to be opened. Either PortID or PodID must be specified.
PodID	C	—	The PodID for which the door should be opened. Either PortID or PodID must be specified.
CMStatus	—	M	Information concerning the result of the service.

18.5.12 *PodIn*

18.5.12.1 The PodIn service is only used to request the internal buffer equipment internalize a carrier that has been moved to the load port via a previous PodOut service. When using host based verification, the production equipment shall move the pod in to the internal buffer for the first time after receiving the ProceedWithPod request. If the PodIn service is received by the production equipment without previously having received a PodOut service for the carrier, the service will be refused.

Table 47 PodIn Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
PodID	M	—	The CarrierID for the carrier to internalize.
CMStatus	—	M	Information concerning the result of the service.

18.5.13 *PodOut* — The PodOut service is sent to internal buffer production equipment, to request that the equipment move the specified carrier to a load port, as soon as the carrier is completed. When the CarrierOut service is started, the destination load port state becomes TRANSFER BLOCKED, and the load port's association state becomes ASSOCIATED.

18.5.13.1 *PodOut Queueing*

18.5.13.1.1 This service request can be queued by the production equipment. The production equipment is required to support a queue of n size, where n is equal to the sum of the number of internal buffer locations and the number of internal FIMS ports. The order of the queue is FIFO for each load port. If the load port is not specified in service request, the equipment chooses which load port queue to place the PodOut service. The queued service does not take effect until the current substrate handling action is complete (i.e., filling, emptying of the pod) and the load port is in the NOT ASSOCIATED state. When a PodOut service is queued and the production equipment load port is currently in the TRANSFER BLOCKED state, the production equipment shall keep the load port in the TRANSFER BLOCKED state. Then, after the port is cleared, the PodOut service shall begin.

Table 48 PodOut Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
PodID	M	—	PodID for the carrier to be moved out.

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
PortID	C	—	If omitted, the production equipment shall select an appropriate port at the time the pod is ready to be moved.
CMStatus	—	M	Information concerning the result of the service.

18.5.14 *PodRelease*

18.5.14.1 *PodRelease* request is used to tell the equipment that the pod is ready to be moved away from the read or write position. Equipment shall deny the request if LocationID and PodID are mismatched. ReticlePodLocationID is a ReticlePod attribute.

Table 49 PodRelease Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
ReticlePod-LocationID	C	—	The ID for the location of the pod. Either ReticlePodLocationID or PodID must be used.
PodID	C	—	The PodID of the pod. Either ReticlePodLocationID or PodID must be used.
CMStatus	—	M	Information concerning the result of the service.

18.5.15 *PodTagReadData*

18.5.15.1 *PodTagReadData* is used to request a block of data from the PodID tag. Equipment shall deny the request if LocationID and PodID are mismatched.

Table 50 PodTagReadData Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
LocationID	C	—	The ID for the location of the pod. Either LocationID or PodID must be used.
PodID	C	—	The PodID of the pod. Either LocationID or PodID must be used.
DataSeg	C	—	Indicates a specific section of data.
DataSize	C	—	Indicates the number of bytes to read.
Data	—	C	Data from the PodID tag. May be NULL if no data exists for the given section.
CMStatus	—	M	Information concerning the result of the service.

18.5.16 *PodTagWriteData*

18.5.16.1 *PodTagWriteData* is used to request that a block of data be written to the PodID tag. Equipment shall deny the request if LocationID and PodID are mismatched.

Table 51 PodTagWriteData Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
LocationID	C	—	The ID for the location of the pod. Either LocationID or PodID must be used.
PodID	C	—	The PodID of the pod. Either LocationID or PodID must be used.
DataSeg	C	—	Indicates a specific section of data.
DataSize	C	—	Indicates the number of bytes to read.
Data	M	—	Data from the PodID tag. May be NULL if no data exists for the given section.

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
CMStatus	—	M	Information concerning the result of the service.

18.5.17 *Re-QualifyReticle*

18.5.17.1 The Re-QualifyReticle service is sent by the host to indicate that a reticle should be re-qualified.

Table 52 Re-QualifyReticle Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
ReticleID	M	—	ReticleID to remove from equipment.
RPMStatus	—	M	Information concerning the result of the service.

18.5.18 *ReserveAtPort*

18.5.18.1 The ReserveAtPort service is sent by the host to indicate future activity at the load port. This allows for reserving the port but doing host based ID verification. The load port will enter the RESERVED State after receiving this service.

Table 53 ReserveAtPort Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
PortID	M	—	The Port ID to reserve.
CMStatus	—	M	Information concerning the result of the service.

18.5.19 *ReticleTransferJob*

18.5.19.1 The ReticleTransferJob service is sent by the host to inform the equipment of the expected arrival of a reticle pod to a reticle pod load port and/or the expected departure of a reticle pod. The equipment should create an association between the reticle pod and reticle load port. The equipment should transition the load port reservation state model to RESERVED. The ReticleTransferJob service is also used by the host to inform the equipment which reticles contained in the reticle pod should be removed and placed in the equipment. Lastly the ReticleTransferJob service is used by the host to inform the equipment which reticles contained in the equipment should be removed from the equipment and placed in the reticle pod. This service is optional.

Table 54 ReticleTransferJob Service Parameter Definitions

<i>Parameter Name</i>	<i>Req/Ind</i>	<i>Rsp/Conf</i>	<i>Description</i>
PodID	M	—	The PodID of the pod which will delivered to the equipment.
InputPortID	M	—	The Port ID where the pod will be received. If zero: The pod must be picked from the tool's internal buffer (for internal buffer equipment only). Either InputPortID or OutputPortID must be used (both may be specified as well).
OutputPortID	M	—	The Port ID to which the pod will be delivered after having executed all related reticle actions. If zero: The pod will remain in the tool's internal buffer (for internal buffer equipment only). Either InputPortID or OutputPortID must be used (both may be specified as well).
PodPropertiesList	C	—	A list of name value pairs providing attributes for the pod object being instantiated with the ReticleTransferJob service.



Parameter Name	Req/Ind	Rsp/Conf	Description
ArrivingReticleList	C	—	The list of reticles to remove from the reticle pod and place in the equipment. Either ArrivingReticleList or DepartingReticleList must be used.
DepartingReticleList	C	—	The list of reticle to remove from the equipment and place in the reticle pod. Either ArrivingReticleList or DepartingReticleList must be used.
RPMStatus	—	M	Information concerning the result of the service.

18.5.20 *Unclamp*

18.5.20.1 The Unclamp service is used by the host if the equipment has separate mechanisms for unclamping the carrier that are independent of opening the carrier. It is used to instruct equipment to disengage the independent clamping mechanism. It is used by the host when “macro” instructions such as provided by Bind, PodNotification, ProceedWithPod and ReticleTransferJob have not been provided by the host.

Table 55 Unclamp Service Parameter Definitions

Parameter Name	Req/Ind	Rsp/Conf	Description
PodID	C	—	The PodID of the pod to unclamp. Either the PodID or the PortID must be specified.
PortID	C	—	The PortID for which to unclamp a carrier. Either the PodID or the PortID must be specified.
CMStatus	—	M	Information concerning the result of the service.

19 Pod Tag Read/Write

19.1 Some technologies allow data to be stored on a PodID tag where it can be subsequently read and/or modified. In one case the equipment can write information to the PodID tag. For example, the equipment will have knowledge of the ReticleID of a reticle placed in a pod. At this time the equipment may write the ReticleID on the PodID tag. In another case, it is the host that specifies when this data is written and read, because the equipment has no knowledge of the contents of the data. The read operations shall be performed only when the pod is at the read position. The write operations shall be performed only when the pod is at the write position.

NOTE 2: The read and write positions may be the same position. The host shall be able to both read and write whenever PodHold switch is set to Host Release and the pod is at the respective read or write position. Once the host has completed all of its read and write operations for that pod, then the host sends the PodRelease request to the equipment. The PodRelease service informs the equipment that pod read or pod write is complete. The PodRelease service has a different purpose from the PodOut service. The intent of the PodOut service request is to move the pod to a load port, while the intent of the PodRelease service request is to inform equipment that it may move the pod away from the read or write position. Therefore, PodOut may also be used with the PodRelease command. If PodHold is Host Release, then the pod shall be kept at the write position until an PodRelease service request is received, regardless of when a PodOut is sent. If PodHold is set to Equipment Release, then the PodRelease request has no effect.

20 Additional Events

20.1 This section identifies data collection events that are not related to State transitions for variable data items. The intent of this section is to ensure certain data is available for specific events that are not related to state transitions, not to define all the additional collection events for RPMS. Also, all state transitions in RPMS state models are required to have associated event reports.

20.2 *Buffer Capacity Changed Event*

20.2.1 An event shall be generated whenever Buffer Capacity changes. This applies to all internal buffers and internal buffer partitions.



20.2.2 Data required to be available for this event report:

- BufferPartitionInfo

20.3 *Pod Closed Event*

20.3.1 If the pod is equipped with a door, an event shall be generated when a pod door has been closed.

20.3.2 Data required to be available for this event report:

- PodID,
- LocationID, and
- PortID (if valid).

20.4 *Pod Location Change Event*

20.4.1 An event shall be generated whenever a pod has changed location. This applies to both load ports, substrate ports, and internal buffer locations.

20.4.2 Data required to be available for this event report:

- PodID,
- LocationID (new destination location), and
- PodLocationMatrix.

20.5 *Pod Opened Event*

20.5.1 If the pod is equipped with a door, an event shall be generated when a pod door has been opened.

20.5.2 Data required to be available for this event report:

- PodID,
- LocationID, and
- PortID (if valid).

20.6 *PodID Read Fail Event*

20.6.1 An event shall be generated when the equipment attempts to read a PodID and fails at a port in the NOT ASSOCIATED STATE.

20.6.2 Data required to be available for this event report:

- PortID

20.7 *ID Reader Unavailable Event*

20.7.1 An event shall be generated whenever an id reader becomes unavailable for any reason. This applies to all load ports.

20.7.2 Data required to be available for this event report:

- Port ID

20.8 *ID Reader Available Event*

20.8.1 An event shall be generated whenever an id reader becomes available. This applies to all load ports.

20.8.2 Data required to be available for this event report:

- Port ID

20.9 *Reticle Usage Warning Limit Event*

20.9.1 An Event shall be generated whenever a reticle is nearing the configurable limits of usage



20.9.2 Data required to be available for this event

- ReticleID

20.10 *ReticleTransferJob Complete Event*

20.10.1 An event shall be generated whenever a ReticleTransferJob completes.

20.10.2 Data required to available for this event:

- PodID

21 Variable Data

21.1 The purpose of this section is to define the list of variable data requirements for RPMS equipment. Values of these variables are available to the host via collection event reports and host status queries. Some of the data items listed are valid for internal buffer production equipment only, and are marked as such.

21.2 *Variable Data Definitions*

21.2.1 The following table defines variable data that shall be provided by the production equipment. Also, for the objects defined by Reticle and Pod Management, the identifier of that object and all of the attributes of that object shall be available for inclusion in event reports associated with that object. Subscripted variables are used either as items within a list or to differentiate data representing different entities. Subscripted variables are always valid.

Table 56 Variable Data Definitions

Variable Name	Description	Type	Access	Comment
AccessMode _i	The access mode for the i th load port.	Enumerated: MANUAL, AUTO	RO	
AlarmInfo	The number of the error occurring.	List of 2 items 1. Alarm number 2. Alarm description	RO	The supplier is free to add additional errors beyond what is defined in the Alarm Information table, but the support for alarms defined in that table are required ^{#1} .
AvailPartitionCapacity	The current available buffer capacity for a logical partition inside internal buffer equipment (PartitionCapacity – # of pods in partition).	Positive integer	RO	Only applicable to internal buffer production equipment.
AvailPartitionCapacity _i	The AvailPartitionCapacity for the i th PartitionID within the internal buffer.	Positive integer	RO	Only applicable to internal buffer production equipment.
BufferCapacityList	The current PartitionType, AvailPartitionCapacity, and PartitionCapacity for all logical buffer partitions.	List of n groups of items 1. BufferPartitionInfo ₁ . n. BufferPartitionInfo _n	RO	Only applicable to internal buffer production equipment.
BufferPartitionInfo	The related information for a logical buffer partition.	Structure of 4 items PartitionID PartitionType AvailPartitionCapacity PartitionCapacity	RO	Only applicable to internal buffer production equipment.

<i>Variable Name</i>	<i>Description</i>	<i>Type</i>	<i>Access</i>	<i>Comment</i>
BufferPartitionInfo _i	The related information for the i th buffer partition.	Structure of 4 items PartitionID _i PartitionType _i AvailPartitionCapacity _i PartitionCapacity _i	RO	Only applicable to internal buffer production equipment.
BypassReadID	Enables or disables automatic ID acceptance when the PodID reader is unavailable.	Boolean	RW	If TRUE, the ID provided with Bind is used automatically.
PodID	The ID of the pod.	Text	RO	
PodID _i	The PodID at the i th locationID _i .	Text	RO	
PodLocationMatrix	A list all the pods at/in the equipment. Both internal to the equipment, and on equipment load ports.	List of n pairs of items 1. LocationID ₁ PodID ₁ . . . n. LocationID _n PodID _n	RO	The PodID _i shall be null if there is no pod at the locationID _i . If a pod is at LocationID _i , but the PodID _i is not known, the value of PodID _i shall be "UNKNOWN".
LocationID	The ID of a pod location.	Text	RO	Pod locations are any location at/in the production equipment where a pod may rest.
LocationID _i	The LocationID of the i th pod location.	Text	RO	Pod locations are any location at/in the production equipment where a pod may rest.
PartitionCapacity	The total PartitionCapacity for a logical internal buffer partition.	Positive integer	RO	Only applicable to internal buffer production equipment.
PartitionCapacity _i	The PartitionCapacity for the i th PartitionID of the internal buffer.	Positive integer	RO	Only applicable to internal buffer production equipment.
PartitionID	The ID of a logical internal buffer partition.	Text	RO	Used to identify separate material types in an internal buffer.
PartitionID _i	The ID of the i th logical partition of the internal buffer.	Text	RO	Used to identify separate material types in an internal buffer.
PartitionType	The type of a logical partition within an internal buffer.	Text	RO	Only applicable to internal buffer production equipment. Some examples of logical buffer PartitionType are Product, Dummy, Substrate, and Seed.
PartitionType _i	The PartitionType corresponding with the i th PartitionID.	Text	RO	Only applicable to internal buffer production equipment. Some examples of logical buffer PartitionType are Product, Dummy, Substrate, and Seed.
PortAssociationState	The association state of a load port.	Enumerated: ASSOCIATED, NOT ASSOCIATED	RO	

<i>Variable Name</i>	<i>Description</i>	<i>Type</i>	<i>Access</i>	<i>Comment</i>
PortAssociationState _i	The association state of the i th load port.	Enumerated: ASSOCIATED, NOT ASSOCIATED	RO	
PortAssociationState-List	The current association state for all load ports.	A list of n items 1. PortAssociationState ₁ . . . n. PortAssociationState _n	RO	This can be used to re-synchronize the host.
PortID	ID of a load port.	Positive integer	RO	
PortID _l	ID of the load port where the pod transfer is taking place. One PortID exists for each load port.	Positive integer	RO	
PortStateInfo	The PortAssociationState combined with the PortTransferState.	List of 2 items PortAssociationState PortTransferState	RO	A combination of both port states.
PortStateInfo _i	The PortAssociationState combined with the PortTransferState for the i th load port.	List of 2 items PortAssociationState _i PortTransferState _i	RO	A combination of both port states.
PortStateInfoList	List of PortStateInfo for all load ports.	List of n items 1. PortStateInfo ₁ . . . n. PortStateInfo _n	RO	A list of all the port states for all the ports.
PortTransferState	The current transfer state of a load port.	Enumerated: OUT OF SERVICE, TRANSFER BLOCKED, READY TO LOAD, READY TO UNLOAD	RO	Super states are not included, only sub states.
PortTransferState _i	The current transfer state of the i th load port.	Enumerated: OUT OF SERVICE, TRANSFER BLOCKED, READY TO LOAD, READY TO UNLOAD	RO	Super states are not included, only sub states.
PortTransferStateList	The current Load Port Transfer State for all load ports.	A list of n items 1. PortTransferState ₁ . . . n. PortTransferState _n	RO	This can be used to re-synchronize the host.
Reason	The reason for transition 15, SLOT MAP NOT READ to WAITING FOR HOST.	Enumerated: VERIFICATION NEEDED, VERIFICATION BY EQUIPMENT UNSUCCESSFUL, READ FAIL, IMPROPER WAFER POSITION	RO	Information to aid host in deciding appropriate action.