



Equipment Supplier's Basic Operational Scenarios For Automation

AUX 0013-0705

Foreword

Publication of this document as Auxiliary Information independent of any standards was authorized by a 2/3-majority vote of the Japan Information and Control (I&C) Committee at its meeting in SEMI Japan on April 7, 2005. This action was subsequently approved by the I&C Global Coordinating Subcommittee by e-mail ballot on April 27, 2005 and by the Audit and Reviews Sub-Committee by ballot on May 21, 2005.

Note that Auxiliary Information is intended to be informational only, and is not to be considered a part of or a whole standard.

The information in this document has been furnished by the Equipment Supplier's Forum based on the common understanding within the forum member companies.

This document is intended to provide typical operation scenarios that reflect the experiences of Equipment Suppliers in the 300mm field and to facilitate them sharing under common understanding.

This document was developed by ESF¹ (Equipment Supplier's Forum) in March, 2005.

The intended use of the Auxiliary Information are as follows:

- (1) Provide common scenarios based on the SEMI 300mm standards,
- (2) Visualize operational variations defined in SEMI 300mm standards, and
- (3) Clarify the relationship between SEMI 300mm standards and contribute to identifying actual operational problems.

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¹ ESF is a voluntary group of Equipment Suppliers and has been studying implementations and effective operations of the SEMI Standards.

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Equipment Supplier's Basic Operational Scenarios for Automation

Version 1.00

Equipment Supplier's Forum

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1 Overview

The purpose of this document is to provide typical operation scenarios based on mainly SEMI Standards E40 (Process Job), E94 (Control Job), and E87 (Carrier Management). This document does not contain Exception Handling because it addresses only scenarios during the normal operation when the Automated Material Transfer is used. Details of actual operation scenarios may be different from the scenarios described in this document due to the Equipment structure or the Equipment specifications.

Referenced Standards

- SEMI E30-1103
- SEMI E40-0304 and SEMI E40.1-0304
- SEMI E87-0304 and SEMI E87-0702
- SEMI E94-1104 and SEMI E94-1104

The operation scenarios are classified into main three parts in this document: “Carrier Transfer for Fixed Buffer Equipment”, “Carrier Transfer for Internal Buffer Equipment”, and “Job Creation and Execution”. Each part of the scenarios has variations due to operational options. The combination of these variation scenarios, based on actual operation requirements could provide a scenario that meets specific Equipment user’s operation requirements.

This chapter explains conceptual relationships between Material Transfer and Processing.

1.1 Conceptual Relationships between Material and Processing

1.1.1 Conceptual Relationships between Material Transfer and Process Execution

This section describes the concept of the relationships between Material Transfer and Processing in the operations based on SEMI E40, E94, and E87.

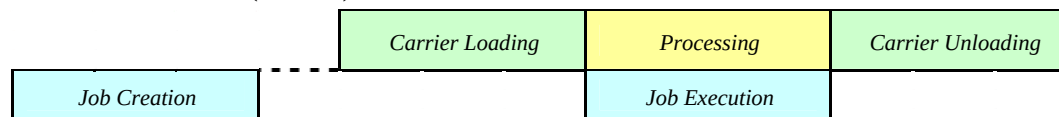
A processing is instructed by Process Job (E40) and Control Job (E94). A processing instructed by Jobs generally begins when the following two conditions are satisfied.

- Materials required for a processing arrive at the Equipment.
- Equipment resources required for a processing are available.

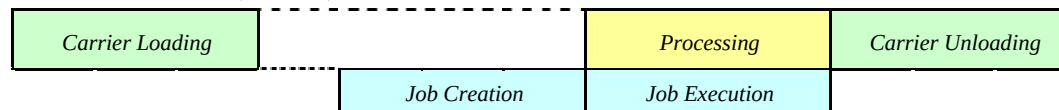
An Equipment user can choose whether a Job is created before or after a material arrival, according to the Equipment user's operational policy.

The conceptual relationships between Material Transfer to/from Equipment and Processing could be illustrated as the following figure.

Job Creation Before Carrier (Material) Arrival



Job Creation After Carrier (Material) Arrival



1.1.2 Conceptual Relationships between Process Job and Control Job

This section describes the concept of the relationships between Control Job (SEMI E94) and Process Job (SEMI E40).

Since Process Jobs are linked to a Control Job, the linked Process Jobs must be created before the Control Job creation.

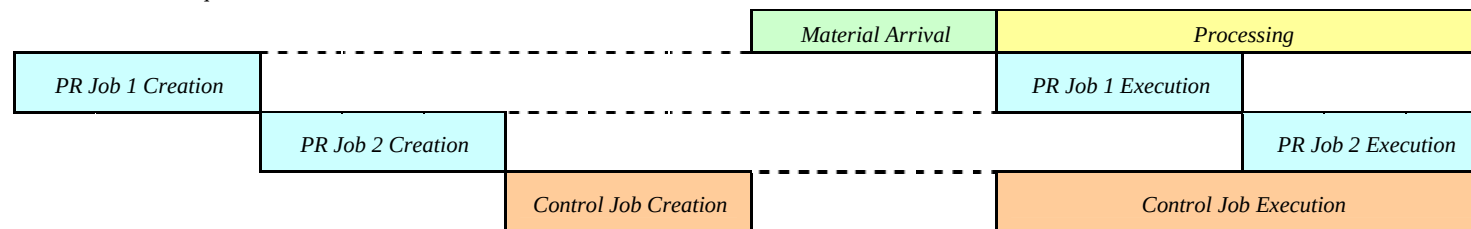
An execution order of the Process Jobs that are linked to the Control Job is specified in the Control Job settings. When the first Process Job in the execution order becomes available for its execution, the Control Job and the Process Job start. And then, the subsequent Process Job starts when it becomes available for its execution.

Whether multiple Process Jobs can be executed simultaneously depends on the Equipment specifications. When multiple Process Jobs are executed simultaneously, events are reported for each Process Job, based on each processing status. That is, from the Process Job's perspective, even when more than one Process Job is executed simultaneously, each Process Job performs processing independently.

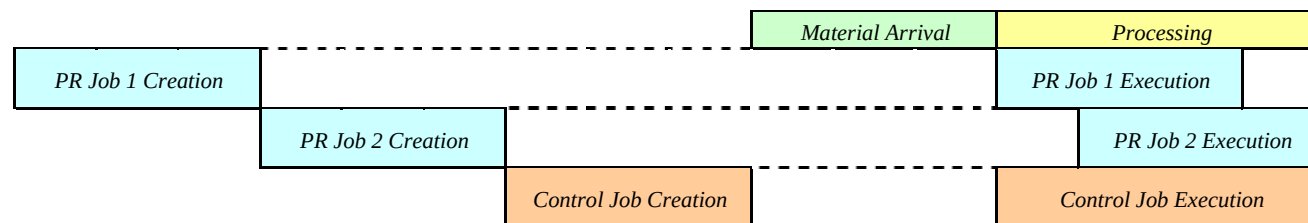
When all Process Jobs that are linked to the Control Job are completed, the corresponding Control Job is completed.

The conceptual relationships between the Process Job and the Control Job could be illustrated as the following figures.

Process Job Sequential Execution



Process Job Parallel Execution

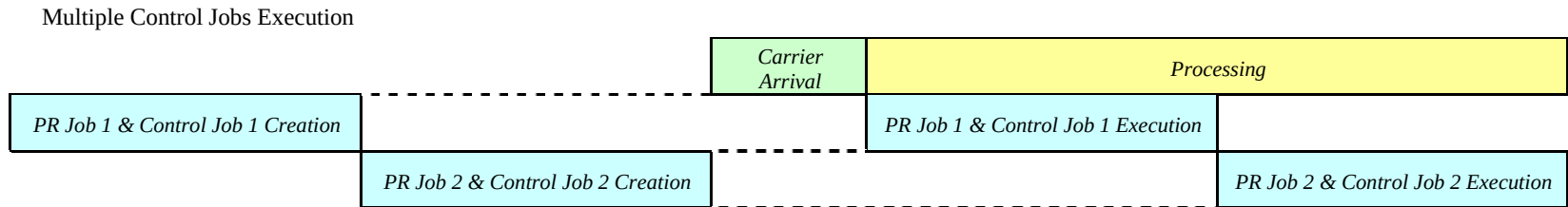


1.1.3 Conceptual Relationships between Control Jobs

This section describes the concept of the relationships between multiple Control Jobs that are linked to one carrier.

When multiple Control Jobs are linked to one carrier, each Control Job is executed independently from the Control Job perspective. Therefore, events are reported based on each Control Job processing status.

The conceptual relationships between multiple Control Jobs that are linked to one carrier could be illustrated as the following figure.

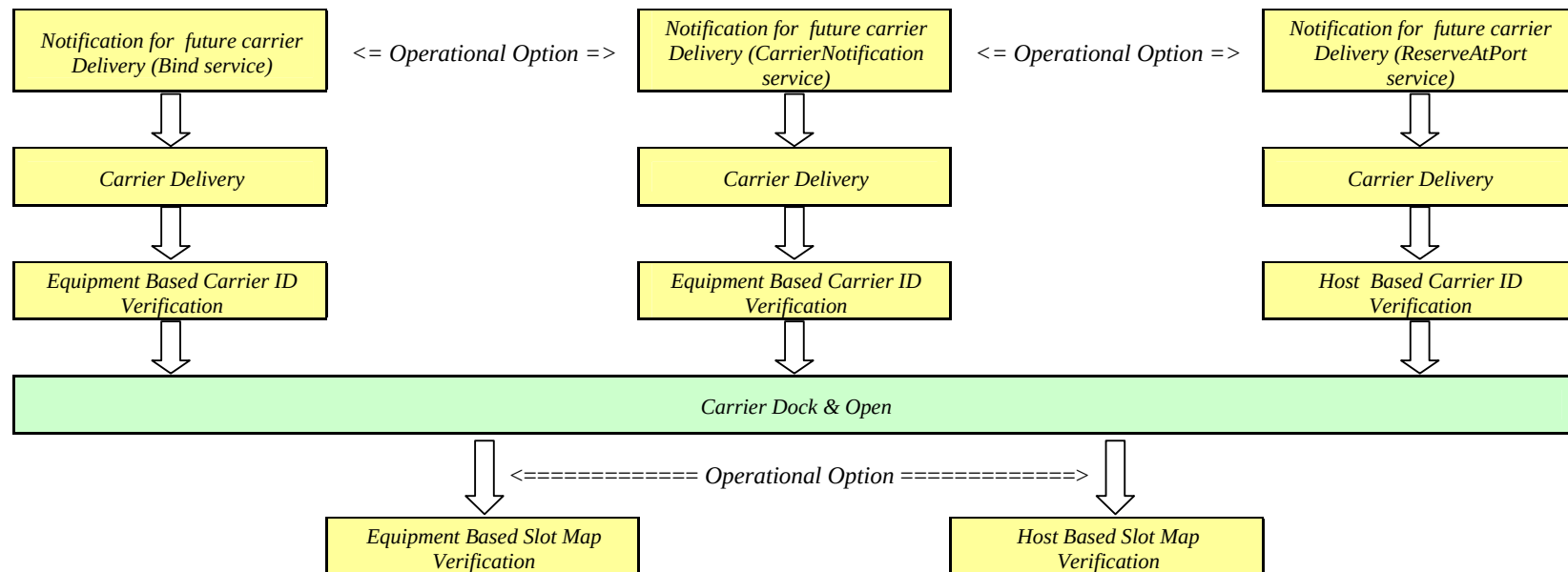


1.2 Conceptual Carrier Transfer Flow

There are several variations in Carrier Transfer to/from Equipment processes, depending on Equipment types, Equipment physical structures, and operations. This section describes these conceptual variations.

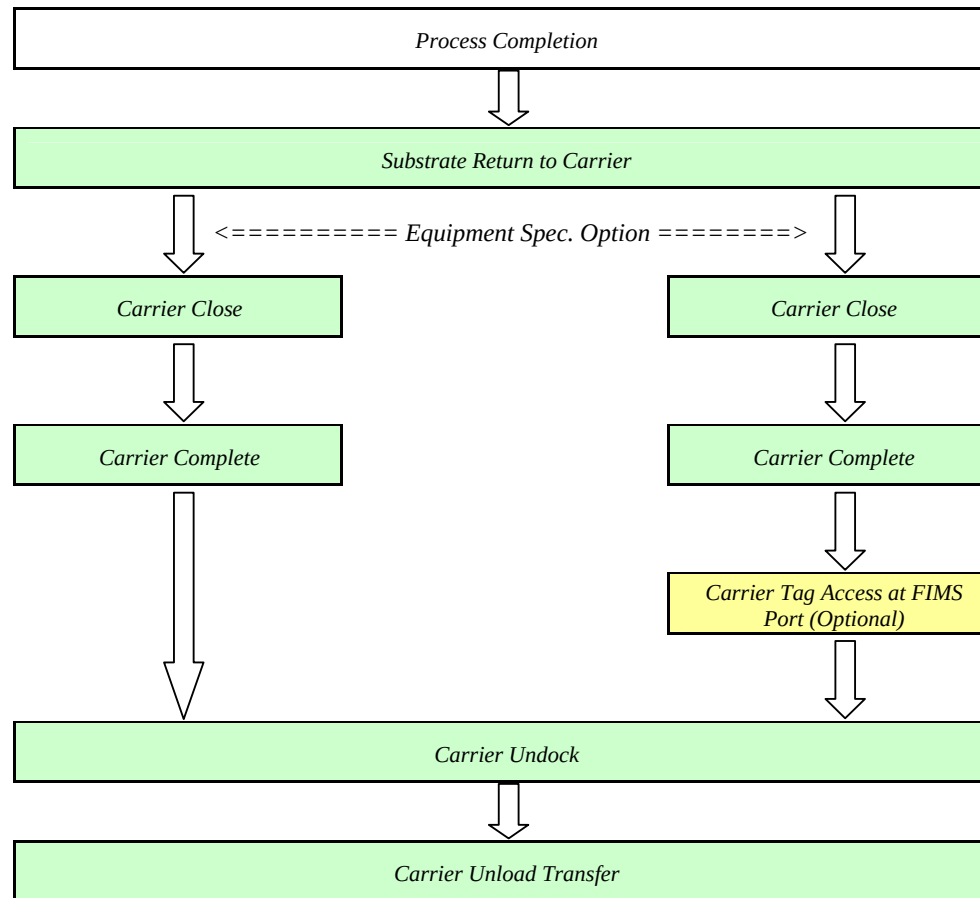
1.2.1 Conceptual Carrier Load Transfer Flow

Conceptual Carrier Load Transfer scenarios could be illustrated in the following flow chart. Note that this flow chart is generalized without considering the Equipment types and Equipment physical structures.



1.2.2 Conceptual Carrier Unload Transfer Flow

Conceptual Carrier Unload Transfer scenarios could be illustrated in the following flow chart. Note that this flow chart is generalized without considering the Equipment types and Equipment physical structures.



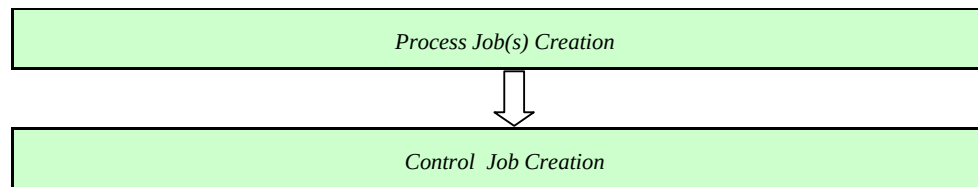
1.3 Conceptual Processing Flow

The Processing flow could be classified into two parts; the Job creation and the Job execution.

1.3.1 Job Creation Flow

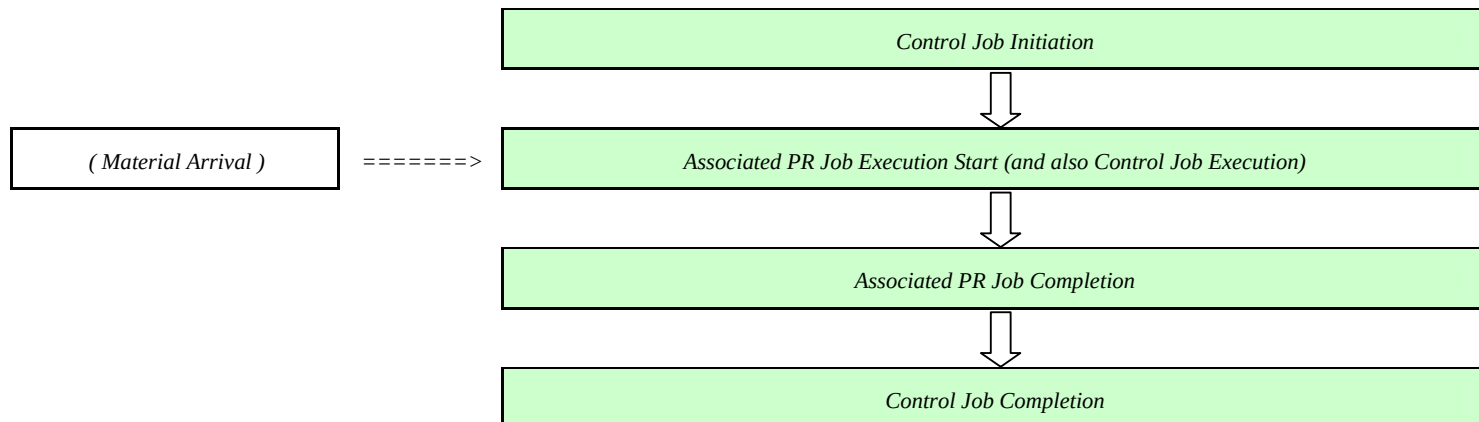
The Job creation flow is illustrated in the following flow chart.

The Job creation flow illustrates that the Process Jobs to be linked must be created before a Control Job creation.



1.3.2 Job Execution Flow

The Job execution flow is illustrated in the following flow chart. Note that this flow chart is illustrated without considering the number of Process Jobs.



1.4 Conventions

1.4.1 Scenario Table

The scenarios in this document are described using a table format described in the following table.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	State Model	State Model	State Model

- Host View

This column describes Equipment states from the Host view. Occurrences that the Host can not recognize are described in brackets.

- Primary Direction

The primary direction is indicated when SECS II messages are exchanged between the Host and the Equipment.

“H -> E” indicates that a primary message is sent from the Host to the Equipment.

“H <- E” indicates that a primary message is sent from the Equipment to the Host.

- SECS Message

This column describes SECS II messages between the Host and the Equipment. Service names and event names are described in brackets. For a state transition event report, a state (name) after a transition is described in brackets.

- Equipment Action & Behavior

This column describes an Equipment action or behavior, including state transitions of the state model that occur on the Equipment.

- State Model

States of each state model are described in such columns as LPTS and LRS to the right of Equipment Action & Behavior column, using the abbreviations in Section 1.5.2.

1.4.2 Abbreviations**Carrier Management Standard (E87)**

LPTS	: Load Port Transfer State Model	LRS	: Load Port Reservation State Model
RTL	: READY TO LOAD	NR	: NOT RESERVED
RTU	: READY TO UNLOAD	R	: RESERVED
TB	: TRANSFER BLOCKED		
OS	: OUT OF SERVICE		

LCAS	: Load Port/Carrier Association State Model
NA	: NOT ASSOCIATED
A	: ASSOCIATED

CIDS	: Carrier ID Status	CSMS	: Carrier Slot Map Status	CAS	: Carrier Accessing Status
INR	: ID NOT READ	SNR	: SLOT MAP NOT READ	NA	: NOT ACCESSED
WFH	: (ID) WAITING FOR HOST	WFH	: (SLOT MAP) WAITING FOR HOST	IA	: IN ACCESS
IVO	: ID VERIFICATION OK	SVO	: SLOT MAP VERIFICATION OK	CC	: CARRIER COMPLETE
IVF	: ID VERIFICATION FAILED	SVF	: SLOT MAP VERIFICATION FAIL	CS	: CARRIER STOPPED

Process Job Management Standard (E40)

PJS	: Process Job State Model				
Q/P	: QUEUED/POOLED	P	: PROCESSING	PG	: PAUSING
SU	: SETTING UP	PC	: PROCESS COMPLETE	PD	: PAUSED
WFS	: WAITING FOR START	STP	: STOPPING	A	: ABORTING

Control Job Management Standard (E94)

CJS : Control Job State Model

Q : QUEUED

S : SELECTED

WFS : WAITING FOR START

E : EXECUTING

P : PAUSED

C : COMPLETED

1.4.3 How to Read Scenarios

This section describes how to read scenarios by providing the following example.

< Example >

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Equipment uses the carrier for processing.) Note that no Carrier Tag Reader/Writer is installed.	TB	NR	A	IVO	SVO	IA
Carrier Completion										
1	(Processing completes for the carrier.)	- - -	- - -	All the wafers return to the carrier and no processing is assigned to the wafers in the carrier.	TB	NR	A	IVO	SVO	IA
2	(The carrier door is closed and the carrier completes.)	- - -	- - -	Equipment closes the carrier door. (1) CAS transitions to CARRIER COMPLETE via transition #19.						CC
3	Equipment notifies Host that the carrier door has been Closed. ----- Equipment notifies Host that the carrier has completed.	H <- E ----- H <- E	S6F11/S6F12 (Carrier Closed) ----- S6F11/S6F12 (CARRIER COMPLETE)	Equipment sends a Carrier Closed event (E87). ----- Equipment sends a state transition event, CARRIER COMPLETE.						
Go to section 2.2.3, Unload Transfer.										

The No. 0 line describes the initial state when a scenario starts. For the example above, the Equipment Action & Behavior column describes that Equipment uses the carrier for processing.

“Carrier Completion” described above is a sub-title for better understanding.

Multiple events that occur simultaneously are described in the same line. Dashed lines may be used for identifying the multiple events. Such dashed line is used in the No.3 line of the example table. For No.3 of the table, the Carrier Closed event and the state transition event of Carrier Accessing Status are reported simultaneously. Actual reporting order of these two event reports is not necessarily the same as that described in the scenario.

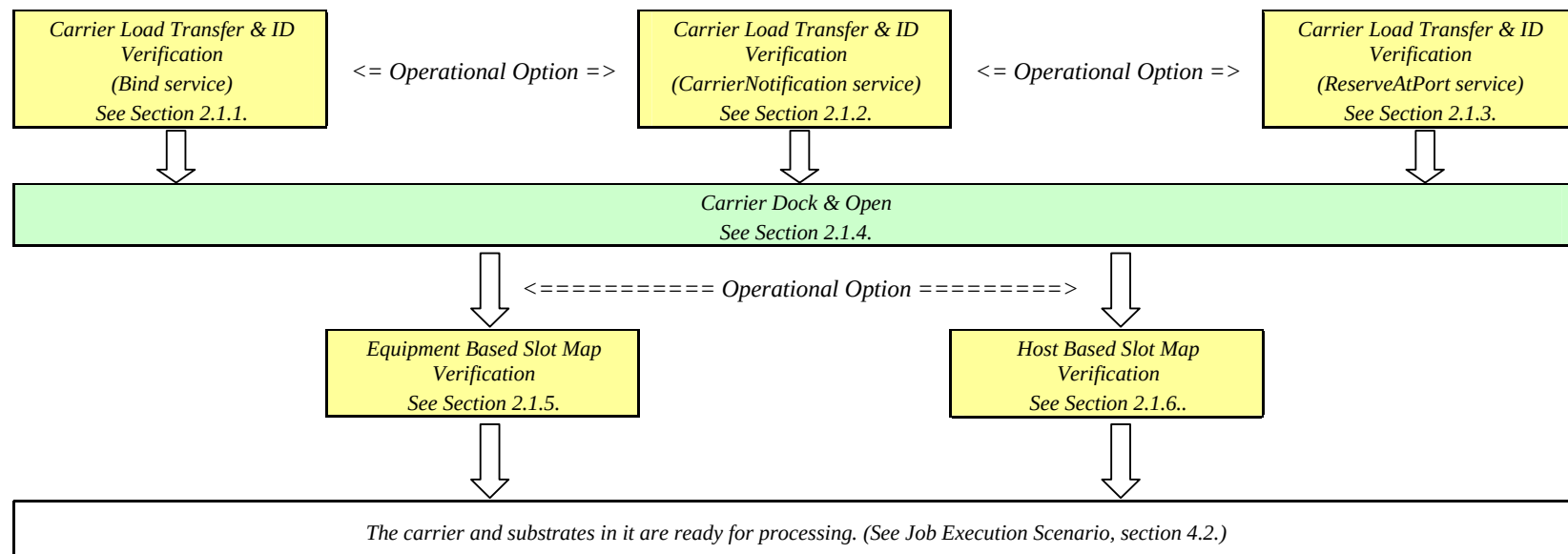
The last line of the example table describes conditions after the scenario completion. For the example above, the last line describes that the completed scenario is followed by another scenario described in Section 2.2.3 “Unload Transfer.”

2 Carrier Transfer Scenario for Fixed Buffer Equipment

This chapter describes Carrier Transfer Scenarios for the Fixed Buffer Equipment; Section 2.1 describes Carrier Load Transfer Scenarios and Section 2.2 describes Carrier Unload Transfer Scenarios.

2.1 Carrier Load Transfer Scenario

The Carrier Load Transfer Scenarios for the Fixed Buffer Equipment are classified into three main parts, Carrier Load Transfer & ID Verification, Carrier Dock & Open, and Slot Map Verification, as illustrated in the following flow chart:



- Carrier Load Transfer & ID Verification

The first part is the scenario from Carrier Transfer to ID Verification. This part has three variations depending on a Carrier Delivery notification method.

- Carrier Dock & Open

The second part is the scenario from Carrier Dock to Carrier Open. Generally, this part has no variation.

- Slot Map Verification

The last part is the scenario of Slot Map Verification. This part has two variations depending on the Verification method.

For example, if an operational scenario is required where the Carrier Delivery notification through a Bind service and Host Based Slot Map Verification are performed, the scenario can be constructed by combining the scenarios in Section 2.1.1, 2.1.4, and 2.1.6 as described in the chart above.

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

2.1.1 Carrier Load Transfer & ID Verification Scenario (Bind service)

This scenario describes a situation where the Carrier Delivery notification and the load port reservation are performed through the Bind service.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Load port is available for Carrier Load Transfer.)	RTL	NR	NA	no state	no state	no state
Notification and Reservation for Future Carrier Delivery										
1	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.	RTL	NR	NA	no state	no state	no state
2	Only if the Access Mode transitions to AUTO. Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
3	Host sends a Bind service for future carrier delivery by AMHS. <i>Note 1</i> <i>If Slot Map is provided by the Bind service, Equipment Based Slot Map Verification is performed.</i> <i>Note 2</i> <i>If Content Map is provided by the</i>	H -> E	S3F17/S3F18 (Bind)	Equipment accepts the Bind service. ----- Equipment reserves the load port for future carrier delivery. (1) LRS transitions to RESERVED via Transition #2. (2) Note that Access Mode of the load port is frozen during RESERVED. -----		R	A	INR	SNR	NA

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
	Bind service, Equipment instantiates substrate objects with provided Substrate IDs in Content Map.			Equipment instantiates the carrier object with the provided Carrier ID. (1) CIDS transitions to ID NOT READ via transition #2. (2) CSMS transitions to SLOT MAP NOT READ via transition #12. (3) CAS transitions to NOT ACCESSED via transition #17. Equipment associates the load port with the carrier. (1) Load Port/Carrier Association State (LCAS) transitions to ASSOCIATED via Transition #2.						
4	Equipment notifies Host that the load port has been reserved.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
	Equipment notifies Host that the carrier object with the Carrier ID provided has been instantiated.	H <- E	S6, F11/F12 (ID NOT READ)	Equipment sends a state transition event, ID NOT READ.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6, F11/F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						
Carrier Load Transfer										
5	(AMHS arrives at the load port and Carrier Load Transfer begins.)	- - -	- - -	Equipment begins carrier load transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6.	TB	R	A	INR	SNR	NA
6	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
7	(Carrier Load Transfer completes.)	- - -	- - -	Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3. Equipment clamps the carrier.		NR				

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
8	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
	Equipment notifies Host that the carrier has been clamped.	H <- E	S6F11/S6F12 (Carrier Clamped)	Equipment sends a Carrier Clamped event (E87).						
	Equipment notifies Host of material (i.e. carrier) arrival at the load port.	H <- E	S6F11/S6F12 (Material Received)	Equipment sends a Material Received event (E30).						
Carrier ID Reading (Carrier ID Verification)										
9	(Carrier ID is read.)	- - -	- - -	Equipment successfully reads Carrier ID from the carrier. And the read Carrier ID equals one provided by the precedent Bind service. (1) CIDS transitions to ID VERIFICATION OK via transition #6.	TB	NR	A	IVO	SNR	NA
10	Equipment notifies Host of the successful carrier ID verification.	H <- E	S6, F11/F12 (ID VERIFICATION OK)	Equipment sends a state transition event, ID VERIFICATION OK.						
Go to section 2.1.4, Carrier Dock & Open.										

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

2.1.2 Carrier Load Transfer & ID Verification Scenario (CarrierNotification service)

This scenario describes a situation where the Carrier Delivery notification is performed through a CarrierNotification service and the load port reservation is performed through a ReserveAtPort service.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Load port is available for Carrier Load Transfer.)	RTL	NR	NA	no state	no state	no state
Notification for Future Carrier Delivery										
1	Host sends a CarrierNotification service for future carrier delivery by AMHS. <i>Note 1</i> <i>If Slot Map is provided by the CarrierNotification service, Equipment Based Slot Map Verification is performed.</i> <i>Note 2</i> <i>If Content Map is provided by the CarrierNotification service, Equipment instantiates substrate objects with provided Substrate IDs in Content Map.</i>	H -> E	S3F17/S3F18 (Carrier Notification)	Equipment accepts the CarrierNotification service. Equipment instantiates the carrier object with the provided Carrier ID. (1) CIDS transitions to ID NOT READ via transition #2. (2) CSMS transitions to SLOT MAP NOT READ via transition #12. (3) CAS transitions to NOT ACCESSED via transition #17.	RTL	NR	NA	INR	SNR	NA
2	Equipment notifies Host that the carrier object with the Carrier ID provided has been instantiated.	H <- E	S6, F11/F12 (ID NOT READ)	Equipment sends a state transition event, ID NOT READ.						
3	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.						

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
4	Only if the Access Mode transitions to AUTO. Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
5	Host sends a ReserveAtPort service to reserve a load port for future carrier delivery by AMHS.	H -> E	S3F25/S3F26 (ReserveAtPort)	Equipment accepts the ReserveAtPort service, and then reserves the load port for future carrier delivery. (1) LRS transitions to RESERVED via Transition #2. (2) Note that Access Mode of the load port is frozen during RESERVED.		R				
6	Equipment notifies Host that the load port has been reserved.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
Carrier Load Transfer										
7	(AMHS arrives at the load port and Carrier Load Transfer begins.)	- - -	- - -	Equipment begins carrier load transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6.	TB	R	NA	INR	SNR	NA
8	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
9	(Carrier Load Transfer completes.)	- - -	- - -	Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3. ----- Equipment clamps the carrier.		NR				
10	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
	Equipment notifies Host that the carrier has been clamped.	H <- E	S6F11/S6F12 (Carrier Clamped)	Equipment sends a Carrier Clamped event (E87).						

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
	Equipment notifies Host of material (i.e. carrier) arrival at the load port.	H <- E	S6F11/S6F12 (Material Received)	Equipment sends a Material Received event (E30).						
Carrier ID Reading (Carrier ID Verification)										
11	(Carrier ID is read.)	- - -	- - -	Equipment successfully reads Carrier ID from the carrier. And the read Carrier ID equals one provided by the precedent CarrierNotification service, and then Equipment associates the load port with the carrier. (1) CIDS transitions to ID VERIFICATION OK via transition #6. (2) LCAS transitions to ASSOCIATED via Transition #2.	TB	NR	A	IVO	SNR	NA
12	Equipment notifies Host of the successful ID verification.	H <- E	S6F11/S6F12 (ID VERIFICATION OK)	Equipment sends a state transition event, ID VERIFICATION OK.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6F11/S6F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						
Go to section 2.1.4, Carrier Dock & Open.										

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

2.1.3 Carrier Load Transfer & ID Verification Scenario (ReserveAtPort service)

This scenario describes a situation where the load port reservation is performed through the ReserveAtPort service.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Load port is available for Carrier Load Transfer.)	RTL	NR	NA	no state	no state	no state
Reservation for Future Carrier Delivery										
1	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.	RTL	NR	NA	no state	no state	no state
2	Only if the Access Mode transitions to AUTO. Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
3	Host sends a ReserveAtPort service to reserve a load port for future carrier delivery by AMHS.	H -> E	S3F25/S3F26 (ReserveAtPort)	Equipment accepts the ReserveAtPort service, and then reserves the load port for future carrier delivery. (1) LRS transitions to RESERVED via Transition #2. (2) Note that Access Mode of the load port is frozen during RESERVED.		R				
4	Equipment notifies Host that the load port has been reserved.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
Carrier Load Transfer										

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
5	(AMHS arrives at the load port and Carrier Load Transfer begins.)	---	---	Equipment begins carrier load transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6.	TB	R	NA	no state	no state	no state
6	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
7	(Carrier Load Transfer completes.)	---	---	Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3. ----- Equipment clamps the carrier.		NR				
8	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
	Equipment notifies Host that the carrier has been clamped.	H <- E	S6F11/S6F12 (Carrier Clamped)	Equipment sends a Carrier Clamped event (E87).						
	Equipment notifies Host of material (i.e. carrier) arrival at the load port.	H <- E	S6F11/S6F12 (Material Received)	Equipment sends a Material Received event (E30).						
Carrier ID Reading (Carrier ID Verification)										
9	(Carrier ID is read.)	---	---	Equipment successfully reads Carrier ID from the carrier. ----- Equipment instantiates the carrier object with the actually read Carrier ID. (1) CIDS transitions to WAITING FOR HOST via transition #3. (2) CSMS transitions to SLOT MAP NOT READ via transition #12. (3) CAS transitions to NOT ACCESSED via transition #17.	TB	NR	A	WFH	SNR	NA

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
				Equipment associates the load port with the carrier. (1) LCAS transitions to ASSOCIATED via Transition #2.						
10	Equipment notifies Host that the carrier object has been instantiated.	H <- E	S6F11/S6F12 (ID WAITING FOR HOST)	Equipment sends a state transition event, (ID) WAITING FOR HOST.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6F11/S6F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						
11	Host sends a ProceedWithCarrier to indicate successful carrier ID verification. <i>Note 1</i> <i>If Slot Map is provided by the ProceedWithCarrier service, Equipment Based Slot Map Verification is performed.</i> <i>Note 2</i> <i>If Content Map is provided by the ProceedWithCarrier service, Equipment instantiates substrate objects with provided Substrate IDs in Content Map.</i>	H -> E	S3F17/S3F18 (ProceedWith Carrier)	Equipment recognizes the carrier is successfully verified. (1) CIDS transitions to ID VERIFICATION OK via transition #8.				IVO		
12	Equipment notifies Host of the successful ID verification.	H <- E	S6F11/S6F12 (ID VERIFICATION OK)	Equipment sends a state transition event, ID VERIFICATION OK.						
Go to section 2.1.4, Carrier Dock & Open.										

2.1.4 Carrier Dock & Open

This scenario describes a situation where after a successful Carrier ID Verification, a carrier is docked to the FIMS port and the carrier door is opened.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Carrier ID has already been verified successfully.)	TB	NR	A	IVO	SNR	NA
Carrier Dock										
1	(Carrier is docked.)	- - -	- - -	Equipment docks the carrier to FIMS port. (1) The carrier location changes.	TB	NR	A	IVO	SNR	NA
2	Equipment notifies Host of the Carrier Location Change.	H <- E	S6F11/S6F12 (Carrier Location Change)	Equipment sends a Carrier Location Change event (E87).						
Carrier Open										
3	(Carrier door is opened.)	- - -	- - -	Equipment opens the carrier door.	TB	NR	A	IVO	SNR	NA
4	Equipment notifies Host that the carrier door has been opened.	H <- E	S6F11/S6F12 (Carrier Opened)	Equipment sends a Carrier Opened event (E87).						
Go to section 2.1.5, Equipment Based Slot Map Verification, if slot map information is already provided. Go to section 2.1.6, Host Based Slot Map Verification, if slot map information is NOT provided yet.										

2.1.5 Equipment Based Slot Map Verification

This scenario describes Equipment Based Slot Map Verification.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier door has already been opened.)	TB	NR	A	IVO	SNR	NA
Slot Map Reading (Slot Map Verification)										
1	(Slot Map is read.)	---	---	Equipment successfully reads the slot map. And the read slot map equals one provided by Host. (1) CSMS transitions to SLOT MAP VERIFICATION OK via transition #13. <i>Note 1</i> <i>Substrate Objects (E90) are instantiated after a successful slot map verification and state transition events of Substrate State model are reported.</i>	TB	NR	A	IVO	SVO	NA
2	Equipment notifies Host of the successful slot map verification.	H <- E	S6F11/S6F12 (SLOT MAP VERIFICATION OK)	Equipment sends a state transition event, SLOT MAP VERIFICATION OK						
The carrier and substrates in it are ready for processing, that is, material arrival.										

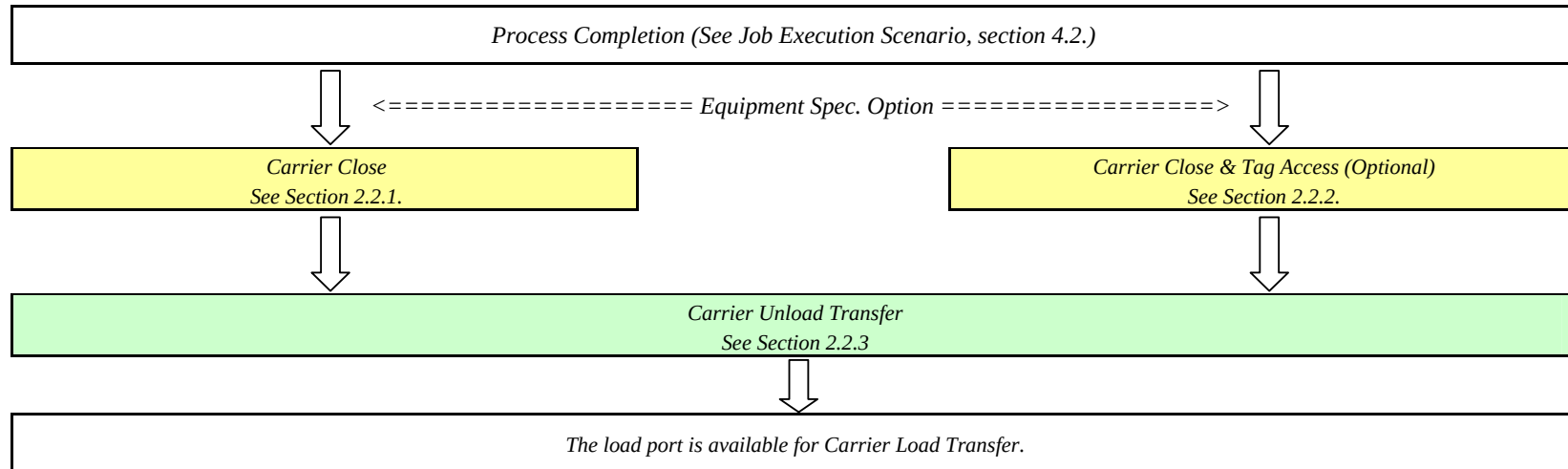
2.1.6 Host Based Slot Map Verification

This scenario describes Host Based Slot Map Verification.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier door has already been opened.)	TB	NR	A	IVO	SNR	NA
Slot Map Reading (Slot Map Verification)										
1	(Slot Map is read.)	- - -	- - -	Equipment successfully reads the slot map. (1) CSMS transitions to WAITING FOR HOST via transition #14.	TB	NR	A	IVO	WFH	NA
2	Equipment notifies Host of the actually read slot map.	H <- E	S6F11/S6F12 (SLOT MAP WAITING FOR HOST)	Equipment sends a state transition event, (SLOT MAP) WAITING FOR HOST.						
3	Host sends a ProceedWithCarrier to indicate successful slot map verification.	H -> E	S3F17/S3F18 (ProceedWith Carrier)	Equipment recognizes the slot map is successfully verified. (1) CSMS transitions to SLOT MAP VERIFICATION OK via transition #15. <i>Note 1</i> <i>Substrate Objects (E90) are instantiated after a successful slot map verification and state transition events of Substrate State model are reported.</i>					SVO	
4	Equipment notifies Host of the successful slot map verification.	H <- E	S6F11/S6F12 (SLOT MAP VERIFICATION OK)	Equipment sends a state transition event, SLOT MAP VERIFICATION OK						
The carrier and substrates in it are ready for processing, that is, material arrival.										

2.2 Carrier Unload Transfer Scenario

The Carrier Unload Transfer Scenarios for the Fixed Buffer Equipment are classified into two main parts, Carrier Close, and Carrier Unload Transfer, as illustrated in the following flow chart.



- Carrier Close

The first part is the scenario from Carrier Close to Carrier Complete. This part has two variations depending on a Carrier Tag operation.

- Carrier Unload Transfer

The second part is the scenario from Carrier Undock to Carrier Unload. Generally, this part has no variation.

For example, if an operational scenario is required where the Carrier Tag Reader/Writer is not installed on the equipment, the scenario can be constructed by combining the scenarios in Section 2.2.1 and 2.2.3 as described in the chart above.

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

2.2.1 Carrier Close

This scenario describes a situation from the substrates returning to a carrier to carrier door close if the Carrier Tag Reader/Writer is not installed.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Equipment uses the carrier for processing.) Note that no Carrier Tag Reader/Writer is installed.	TB	NR	A	IVO	SVO	IA
Carrier Completion										
1	(Processing completes for the carrier.)	---	---	All the wafers return to the carrier and no processing is assigned to the wafers in the carrier.	TB	NR	A	IVO	SVO	IA
2	(The carrier door is closed and the carrier completes.)	---	---	Equipment closes the carrier door. (1) CAS transitions to CARRIER COMPLETE via transition #19.						CC
3	Equipment notifies Host that the carrier door has been Closed. ----- Equipment notifies Host that the carrier has completed.	H <- E ----- H <- E	S6F11/S6F12 (Carrier Closed) ----- S6F11/S6F12 (CARRIER COMPLETE)	Equipment sends a Carrier Closed event (E87). ----- Equipment sends a state transition event, CARRIER COMPLETE.						
Go to section 2.2.3, Carrier Unload Transfer.										

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

2.2.2 Carrier Close & Tag Access

This scenario describes a situation from the substrates returning to a carrier to carrier door close if the Carrier Tag Reader/Writer is installed.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Equipment uses the carrier for processing.) Note that Carrier Tag Reader/Writer is installed.	TB	NR	A	IVO	SVO	IA
Carrier Completion										
1	(Processing completes for the carrier.)	---	---	All the wafers return to the carrier and no processing is assigned to the wafers in the carrier.	TB	NR	A	IVO	SVO	IA
2	(The carrier door is closed and the carrier completes.)	---	---	Equipment closes the carrier door. (1) CAS transitions to CARRIER COMPLETE via transition #19.						CC
3	Equipment notifies Host that the carrier door has been Closed. ----- Equipment notifies Host that the carrier has completed.	H <- E ----- H <- E	S6F11/S6F12 (Carrier Closed) ----- S6F11/S6F12 (CARRIER COMPLETE)	Equipment sends a Carrier Closed event (E87). ----- Equipment sends a state transition event, CARRIER COMPLETE.						
Carrier Tag Access										
4	Host reads and/or writes the carrier tag.	H -> E	S3F29/S3F30 (Carrier Tag Read Data) and/or S3F31/S3F32 (Carrier Tag Write Data)	Equipment waits completion of carrier tag access. <i>Note 1</i> <i>Equipment does not allowed to move the carrier from Carrier Tag R/W position before receiving CarrierRelease service from Host.</i>	TB	NR	A	IVO	SVO	CC
5	Host sends a CarrierRelease service to indicate tag access completion.	H -> E	S3F17/S3F18 (Carrier Release)	Now Equipment can move the carrier from Tag Read/Write position.						
Go to section 2.2.3, Carrier Unload Transfer.										

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

2.2.3 Carrier Unload Transfer

This scenario describes a situation from Carrier Undock to Carrier Unload.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier is ready for undock.) Note 1 UnclampControl Trigger is set to AMHS Triggered Unclamp.	TB	NR	A	IVO	SVO	CC
Carrier Undock										
1	(Carrier is undocked.)	---	---	Equipment undocks the carrier from FIMS port.	TB	NR	A	IVO	SVO	CC
2	(Carrier is moved to the delivery position.)	---	---	Equipment moves the carrier to the delivery position. (1) LPTS transitions to READY TO UNLOAD via Transition #9. (2) The carrier location changes.	RTU					
3	Equipment notifies Host that the load port has been ready for unload transfer.	H <- E	S6F11/S6F12 (READY TO UNLOAD)	Equipment sends a state transition event, READY TO UNLOAD.						
	Equipment notifies Host of the Carrier Location Change.	H <- E	S6F11/S6F12 (Carrier Location Change)	Equipment sends a Carrier Location Change event (E87).						
Carrier Unload Transfer										
4	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.	RTU	NR	A	IVO	SVO	CC

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
5	Only if the Access Mode transitions to AUTO. Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
6	(AMHS arrives at the load port and Carrier Load Transfer begins.)	- - -	- - -	Equipment unclamps the carrier and begins carrier unload transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #7. <i>Note 1</i> <i>UnclampControl Trigger (E87) is set to AMHS Triggered Unclamp.</i>	TB					
7	Equipment notifies Host that the carrier has been unclamped.	H <- E	S6F11/S6F12 (Carrier Unclamped)	Equipment sends a Carrier Unclamped event (E87).						
	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
8	(Carrier Unload Transfer completes.)	- - -	- - -	Equipment deletes the carrier object and clears the load port/carrier association. (1) Carrier State transitions to no state via transition #21. (2) LPTS transitions to READY TO LOAD via Transition #8. (3) LCAS transitions to NOT ASSOCIATED via Transition #3. <i>Note 1</i> <i>Substrate Objects (E90) are deleted at Carrier Unloading and state transition events of Substrate State model are reported.</i>	RTL		NA	no state	no state	no state
9	Equipment notifies Host that the carrier object has been deleted.	H <- E	S6, F11/F12 (no state)	Equipment sends a state transition event, no state.						

2 Carrier Transfer Scenarios for Fixed Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
	Equipment notifies Host that the load port is available for load transfer.	H <- E	S6, F11/F12 (READY TO LOAD)	Equipment sends a state transition event, READY TO LOAD.						
	Equipment notifies Host that the load port/carrier association has been cleared.	H <- E	S6, F11/F12 (NOT ASSOCIATED)	Equipment sends a state transition event, NOT ASSOCIATED.						
	Equipment notifies Host of material (i.e. carrier) departure from the load port.	H <- E	S6F11/S6F12 (Material Removed)	Equipment sends a Material Removed event (E30).						
The load port is available for Carrier Load Transfer.										

3 Carrier Transfer Scenario for Internal Buffer Equipment

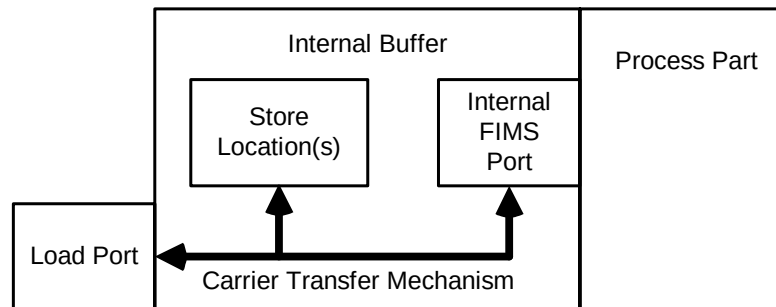
This chapter describes Carrier Transfer Scenarios for the Internal Buffer Equipment; Section 3.1 describes Carrier Load Transfer and Section 3.2 describes Carrier Unload Transfer.

Events for a carrier movement in Equipment and carrier clamp/unclamp are dependent on the Equipment physical structures and the Host does not need to directly control the carrier movement in Equipment and carrier clamp/unclamp. Therefore, the scenarios for the Internal Buffer Equipment described in this chapter do not include any events for the carrier movement in Equipment and carrier clamp/unclamp in order to provide a more common host view.

The scenarios in this chapter do not include the following events.

- Carrier Location Change event (E87),
- Carrier Clamped event (E87), and
- Carrier Unclamped (E87) event.

This chapter assumes that the Internal Buffer Equipment has the following structure.



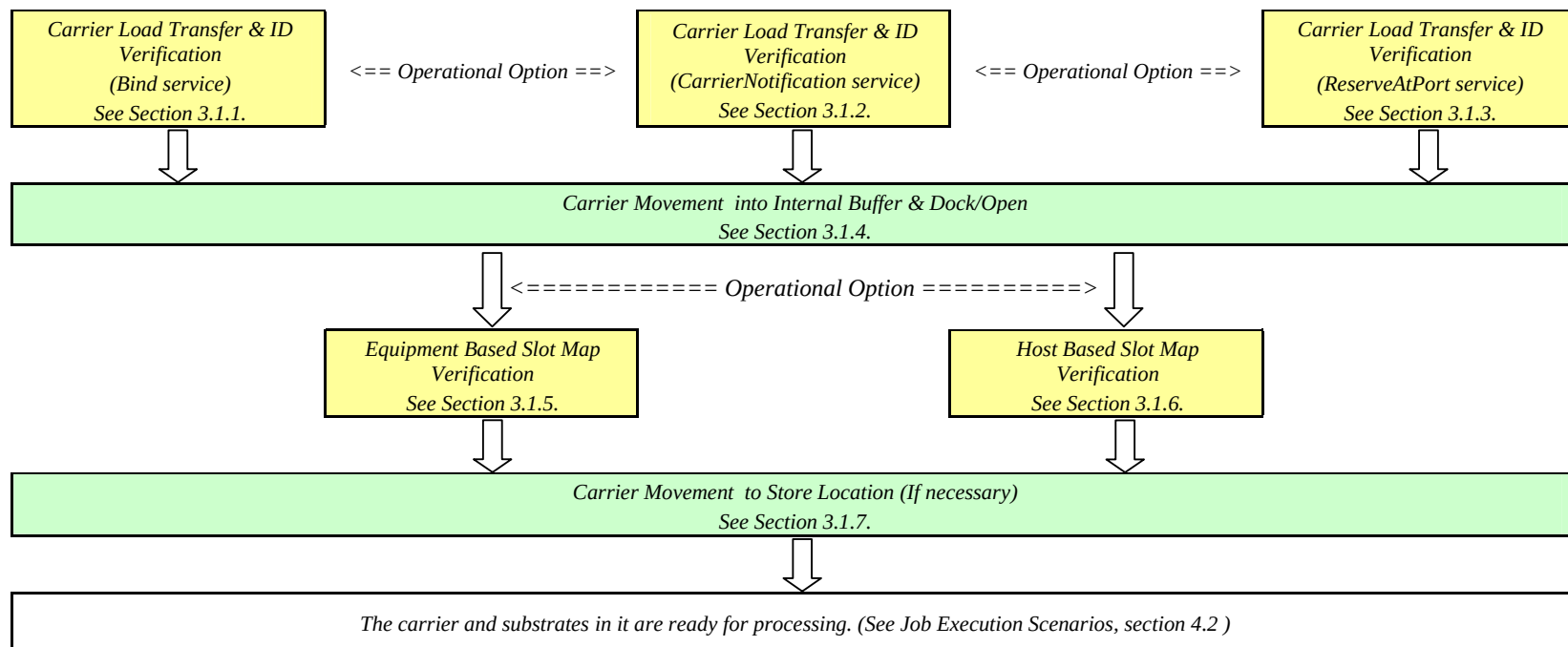
This chapter assumes that Carrier ID Verification is performed at Load Port, and Slot Map Verification is performed at Internal FIMS Port following ID verification. Note that the location and timing for those verifications may depend on Equipment spec.

3.1 Carrier Load Transfer Scenario

This section assumes that a carrier moves within the Equipment in the following order:

- (1) Load Port (Carrier ID Verifictaion)
- (2) Internal FIMS Port (Slot Map Verification)
- (3) Carrier Movement to Store Location, if necessary

The Carrier Load Transfer Scenarios for the Internal Buffer Equipment are classified into four main parts, Carrier Load Transfer & ID Verification, Carrier Movement into Internal Buffer, Slot Map Verification, and Carrier Movement to Store Location, as illustrated in the following flow chart.



3 Carrier Transfer Scenarios for Internal Buffer Equipment

- Carrier Load Transfer & ID Verification

The first part is the scenario from Carrier Transfer to ID Verification. This part has three variations depending on the Carrier Delivery notification method.

- Carrier Movement into Internal Buffer

The second part is the scenario where after the carrier moves from a load port to an Internal FIMS port, the carrier door is opened at the Internal FIMS port. Generally, this part has no variation.

- Slot Map Verification

The third part is the scenario of the Slot Map Verification. There are two variations depending on the Verification method.

- Carrier Movement to Store Location (Equipment dependent)

The last part is the scenario of the carrier movement to the location where the carrier is stored. This scenario may be required for some Equipment specifications. Generally, this part has no variation.

For example, an operational scenario is required where the Carrier Delivery notification through a Bind service and Host Based Slot Map Verification are performed, the scenario can be constructed by combining the scenarios in Section 3.1.1, 3.1.4 and 3.1.6 as described in the chart above.

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.1 Carrier Load Transfer & ID Verification (Bind service)

This scenario describes a situation where the Carrier Delivery notification and load port reservation are performed through the Bind service.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Load port is available for Carrier Load Transfer.)	RTL	NR	NA	no state	no state	no state
Notification and Reservation for Future Carrier Delivery										
1	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.	RTL	NR	NA	no state	no state	no state
2	(Only if the Access Mode transitions to AUTO.) Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
3	Host sends a Bind service containing for future carrier delivery by AMHS. Note 1: If Slot Map is provided by the Bind service, Equipment Based Slot Map Verification is performed. Note 2:	H -> E	S3F17/S3F18 (Bind)	Equipment accepts the Bind service. Equipment reserves the load port for future carrier delivery. (1) LRS transitions to RESERVED via Transition #2. (2) Note that Access Mode of the load port is frozen during RESERVED.		R	A	INR	SNR	NA

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
	If Content Map is provided by the Bind service, Equipment instantiates substrate objects with provided Substrate IDs in Content Map.			Equipment instantiates the carrier object with the provided Carrier ID. (1) CIDS transitions to ID NOT READ via transition #2. (2) CSMS transitions to SLOT MAP NOT READ via transition #12. (3) CAS transitions to NOT ACCESSED via transition #17. Equipment associates the load port with the carrier. (1) Load Port/Carrier Association State (LCAS) transitions to ASSOCIATED via Transition #2.						
4	Equipment notifies Host that the load port has been reserved.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
	Equipment notifies Host that the carrier object with the Carrier ID provided has been instantiated.	H <- E	S6, F11/F12 (ID NOT READ)	Equipment sends a state transition event, ID NOT READ.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6, F11/F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						
Carrier Load Transfer										
5	(AMHS arrives at the load port and Carrier Load Transfer begins.)	- - -	- - -	Equipment begins carrier load transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6.	TB	R	A	INR	SNR	NA
6	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
7	(Carrier Load Transfer completes.)	- - -	- - -	Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3.		NR				

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
8	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
	Equipment notifies Host of material (i.e. carrier) arrival at the load port.	H <- E	S6F11/S6F12 (Material Received)	Equipment sends a Material Received event (E30).						
Carrier ID Reading (Carrier ID Verification)										
9	(Carrier ID is read.)	---	---	Equipment successfully reads Carrier ID from the carrier. And the read Carrier ID equals one provided by the precedent Bind service. (1) CIDS transitions to ID VERIFICATION OK via transition #6.	TB	NR	A	IVO	SNR	NA
10	Equipment notifies Host of the successful carrier ID verification.	H <- E	S6, F11/F12 (ID VERIFICATION OK)	Equipment sends a state transition event, ID VERIFICATION OK.						
Go to section 3.1.4, Carrier Movement into Internal Buffer & Dock/Open.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.2 Carrier Load Transfer & ID Verification (CarrierNotification service)

This scenario describes a situation where the Carrier Delivery notification is performed through the CarrierNotification service and the load port reservation is performed through the ReserveAtPort service.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Load port is available for Carrier Load Transfer.)	RTL	NR	NA	no state	no state	no state
Notification and Reservation for Future Carrier Delivery										
1	Host sends a CarrierNotification service containing for future carrier delivery by AMHS: <i>Note 1:</i> <i>If Slot Map is provided by the CarrierNotification service, Equipment Based Slot Map Verification is performed.</i> <i>Note 2:</i> <i>If Content Map is provided by the CarrierNotification service, Equipment instantiates substrate objects with provided Substrate IDs in Content Map.</i>	H -> E	S3F17/S3F18 (Carrier Notification)	Equipment accepts the Bind service. Equipment instantiates the carrier object with the provided Carrier ID. (1) CIDS transitions to ID NOT READ via transition #2. (2) CSMS transitions to SLOT MAP NOT READ via transition #12. (3) CAS transitions to NOT ACCESSED via transition #17.	RTL	NR	NA	INR	SNR	NA
2	Equipment notifies Host that the carrier object with the Carrier ID provided has been instantiated.	H <- E	S6, F11/F12 (ID NOT READ)	Equipment sends a state transition event, ID NOT READ.						
3	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.						

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
4	Only if the Access Mode transitions to AUTO. Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
5	Host sends a ReserveAtPort service to reserve a load port for future carrier delivery by AMHS.	H -> E	S3F25/S3F26 (ReserveAtPort)	Equipment accepts the ReserveAtPort service. ----- Equipment reserves the load port for future carrier delivery. (1) LRS transitions to RESERVED via Transition #2. (2) Note that Access Mode of the load port is frozen during RESERVED.		R				
6	Equipment notifies Host that the load port has been reserved.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
Carrier Load Transfer										
7	(AMHS arrives at the load port and Carrier Load Transfer begins.)	- - -	- - -	Equipment begins carrier load transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6.	TB	R	NA	INR	SNR	NA
8	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
9	(Carrier Load Transfer completes.)	- - -	- - -	Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3.		NR				
10	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
	Equipment notifies Host of material (i.e. carrier) arrival at the load port.	H <- E	S6F11/S6F12 (Material Received)	Equipment sends a Material Received event (E30).						

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
Carrier ID Reading (Carrier ID Verification)										
11	(Carrier ID is read.)	- - -	- - -	Equipment successfully reads Carrier ID from the carrier. And the read Carrier ID equals one provided by the precedent CarrierNotification service. (1) CIDS transitions to ID VERIFICATION OK via transition #6. ----- Equipment associates the load port with the carrier. (1) LCAS transitions to ASSOCIATED via Transition #2.	TB	NR	A	IVO	SNR	NA
12	Equipment notifies Host of the successful ID verification.	H <- E	S6F11/S6F12 (ID VERIFICATION OK)	Equipment sends a state transition event, ID VERIFICATION OK.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6F11/S6F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						
Go to section 3.1.4, Carrier Movement into Internal Buffer & Dock/Open.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.3 Carrier Load Transfer & ID Verification (ReserveAtPort service)

This scenario describes a situation where the load port reservation is performed through the ReserveAtPort service.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(Load port is available for Carrier Load Transfer.)	RTL	NR	NA	no state	no state	no state
Reservation for Future Carrier Delivery										
1	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.	RTL	NR	NA	no state	no state	no state
2	Only if the Access Mode transitions to AUTO. Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
3	Host sends a ReserveAtPort service to reserve a load port for future carrier delivery by AMHS.	H -> E	S3F25/S3F26 (ReserveAtPort)	Equipment accepts the ReserveAtPort service. ----- Equipment reserves the load port for future carrier delivery. (1) LRS transitions to RESERVED via Transition #2. (2) Note that Access Mode of the load port is frozen during RESERVED.		R				
4	Equipment notifies Host that the load port has been reserved.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
Carrier Load Transfer										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
5	(AMHS arrives at the load port and Carrier Load Transfer begins.)	---	---	Equipment begins carrier load transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6.	TB	R	NA	no state	no state	no state
6	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
7	(Carrier Load Transfer completes.)	---	---	Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3.		NR				
8	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
	Equipment notifies Host of material (i.e. carrier) arrival at the load port.	H <- E	S6F11/S6F12 (Material Received)	Equipment sends a Material Received event (E30).						
Carrier ID Reading (Carrier ID Verification)										
9	(Carrier ID is read.)	---	---	Equipment successfully reads Carrier ID from the carrier. ----- Equipment instantiates the carrier object with the actually read Carrier ID. (1) CIDS transitions to WAITING FOR HOST via transition #3. (2) CSMS transitions to SLOT MAP NOT READ via transition #12. (3) CAS transitions to NOT ACCESSED via transition #17. ----- Equipment associates the load port with the carrier. (1) LCAS transitions to ASSOCIATED via Transition #2.	TB	NR	A	WFH	SNR	NA

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
10	Equipment notifies Host that the carrier object has been instantiated.	H <- E	S6F11/S6F12 (ID WAITING FOR HOST)	Equipment sends a state transition event, (ID) WAITING FOR HOST.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6F11/S6F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						
11	Host sends a ProceedWithCarrier to indicate successful carrier ID verification. <i>Note 1:</i> <i>If Slot Map is provided by the ProceedWithCarrier service, Equipment Based Slot Map Verification is performed.</i> <i>Note 2:</i> <i>If Content Map is provided by the ProceedWithCarrier service, Equipment instantiates substrate objects with provided Substrate IDs in Content Map.</i>	H -> E	S3F17/S3F18 (ProceedWith Carrier)	Equipment recognizes the carrier is successfully verified. (1) CIDS transitions to ID VERIFICATION OK via transition #8.				IVO		
12	Equipment notifies Host of the successful ID verification.	H <- E	S6F11/S6F12 (ID VERIFICATION OK)	Equipment sends a state transition event, ID VERIFICATION OK.						
Go to section 3.1.4, Carrier Movement into Internal Buffer & Dock/Open.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.4 Carrier Movement into Internal Buffer & Dock/Open

This scenario describes a situation where after a successful Carrier ID Verification, a carrier is docked to an Internal FIMS port and the carrier door is opened.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier is on the load port.) (Carrier ID has already been verified successfully.)	TB	NR	A	IVO	SNR	NA
Carrier Movement to Internal FIMS Port										
1	(Carrier is moved to Internal FIMS port.)	---	---	Equipment moves the carrier to Internal FIMS port. (1) LCAS transitions to NOT ASSOCIATED via Transition #3. (2) LPTS transitions to READY TO LOAD via Transition #8. <i>Note 1</i> <i>The carrier location changes and Equipment sends Carrier Location Change event(s) corresponding to location change(s).</i>	RTL	NR	NA	IVO	SNR	NA
2	Equipment notifies Host that the carrier has been removed from the load port.	H <- E	S6F11/S6F12 (NOT ASSOCIATED)	Equipment sends a state transition event, NOT ASSOCIATED.						
	Equipment notifies Host that the carrier has been completely moved to Internal FIMS port.	H <- E	S6F11/S6F12 (READY TO LOAD)	Equipment sends a state transition event, READY TO LOAD.						
Carrier Dock										
3	(Carrier is docked.)	---	---	Equipment docks the carrier to FIMS port. <i>Note 1</i> <i>The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s)</i>	RTL	NR	NA	IVO	SNR	NA
Carrier Open										
4	(Carrier door is opened.)	---	---	Equipment opens the carrier door.	RTL	NR	NA	IVO	SNR	NA

3 Carrier Transfer Scenarios for Internal Buffer Equipment

<i>No.</i>	<i>Host View</i>	<i>Primary Direction</i>	<i>SECS Message (SECS Desc)</i>	<i>Equipment Action & Behavior</i>	<i>LPTS</i>	<i>LRS</i>	<i>LCAS</i>	<i>CIDS</i>	<i>CSMS</i>	<i>CAS</i>
5	Equipment notifies Host that the carrier door has been opened.	H <- E	S6F11/S6F12 (Carrier Opened)	Equipment sends a Carrier Opened event (E87).						
Go to section 3.1.5, Equipment Based Slot Map Verification, if slot map information is already provided. Go to section 3.1.6, Host Based Slot Map Verification, if slot map information is NOT provided yet,										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.5 Equipment Based Slot Map Verification

This scenario describes Equipment Based Slot Map Verification.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier door has already been opened.) <i>Note 1</i> Load Port Transfer State, Load Port Reservation State and Load Port/Carrier Association State are not related to the carrier in this scenario.	---	---	---	IVO	SNR	NA
Slot Map Reading (Slot Map Verification)										
1	(Slot Map is read.)	---	---	Equipment successfully reads the slot map. And the read slot map equals one provided by Host. (1) CSMS transitions to SLOT MAP VERIFICATION OK via transition #13. <i>Note 1</i> Substrate Objects (E90) are instantiated after a successful slot map verification and state transition events of Substrate State model are reported.	---	---	---	IVO	SVO	NA
2	Equipment notifies Host of the successful slot map verification.	H <- E	S6F11/S6F12 (SLOT MAP VERIFICATION OK)	Equipment sends a state transition event, SLOT MAP VERIFICATION OK						
The carrier at the Internal FIMS port and substrates in it are ready for processing, that is, material arrival. It depends on Equipment specification whether the Substrates in the carrier are removed at this time. Go to section 3.1.7, Carrier Movement to Store Location, if the carrier is moved to a store location.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.6 Host Based Slot Map Verification

This scenario describes Host Based Slot Map Verification.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier door has already been opened.) <i>Note 1</i> Load Port Transfer State, Load Port Reservation State and Load Port/Carrier Association State are not related to the carrier in this scenario.	---	---	---	IVO	SNR	NA
Slot Map Reading (Slot Map Verification)										
1	(Slot Map is read.)	---	---	Equipment successfully reads the slot map. (1) CSMS transitions to WAITING FOR HOST via transition #14.	---	---	---	IVO	WFH	NA
2	Equipment notifies Host of the actually read slot map.	H <- E	S6F11/S6F12 (SLOT MAP WAITING FOR HOST)	Equipment sends a state transition event, (SLOT MAP) WAITING FOR HOST.						
3	Host sends a ProceedWithCarrier to indicate successful slot map verification.	H -> E	S3F17/S3F18 (ProceedWith Carrier)	Equipment recognizes the slot map is successfully verified. (1) CSMS transitions to SLOT MAP VERIFICATION OK via transition #15. <i>Note 1</i> Substrate Objects (E90) are instantiated after a successful slot map verification and state transition events of Substrate State model are reported.					SVO	
4	Equipment notifies Host of the successful slot map verification.	H <- E	S6F11/S6F12 (SLOT MAP VERIFICATION OK)	Equipment sends a state transition event, SLOT MAP VERIFICATION OK						

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
The carrier at the Internal FIMS port and substrates in it are ready for processing, that is, material arrival. It depends on Equipment specification whether the Substrates in the carrier are removed at this time. Go to section 3.1.7, Carrier Movement to Store Location, if the carrier is moved to a store location.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.1.7 Carrier Movement to Store Location

This scenario describes the carrier movement to the carrier store location. The scenario may be required for some Equipment structures and Equipment specifications. The timing of substrate removal from the carrier depends on the Equipment structure and Equipment specifications.

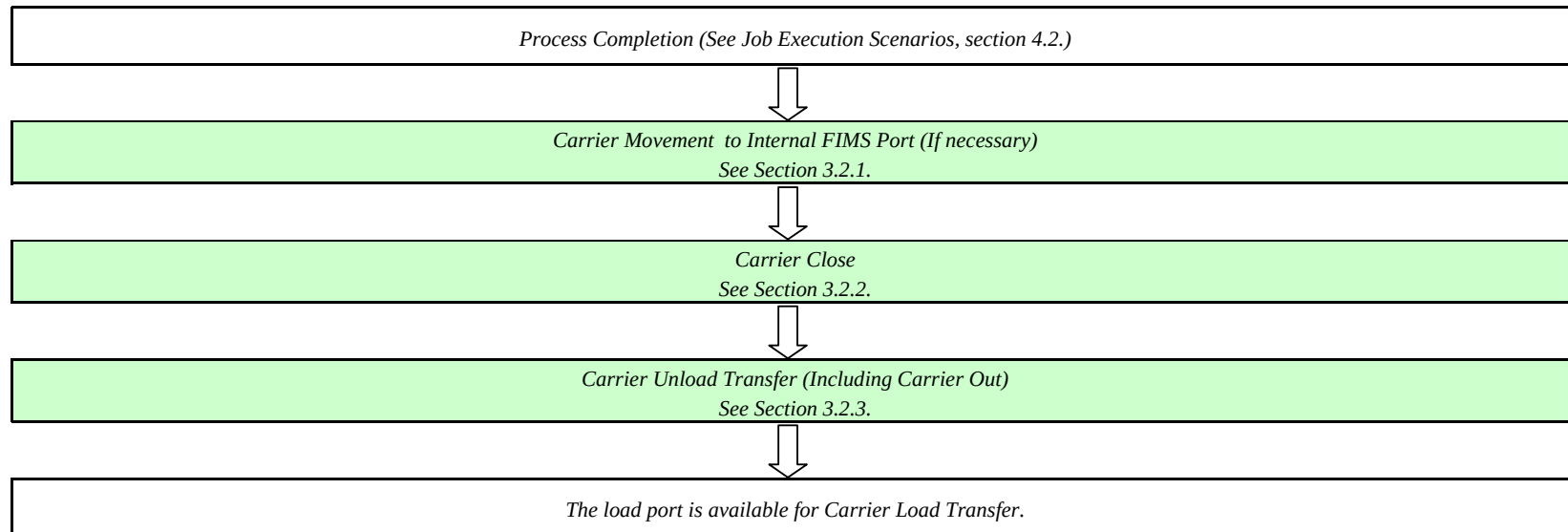
No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier door is opened.) <i>Note 1</i> Load Port Transfer State, Load Port Reservation State and Load Port/Carrier Association State are not related to the carrier in this scenario. <i>Note 2</i> Carrier Accessing Status, NOT ACCESSED or IN ACCESS, depends on Equipment specifications.	---	---	---	IVO	SVO	NA or IA
Carrier Close and Undock										
1	(The carrier door is closed.)	---	---	Equipment closes the carrier door.	---	---	---	IVO	SVO	NA or IA
2	Equipment notifies Host that the carrier door has been Closed.	H <- E	S6F11/S6F12 (Carrier Closed)	Equipment sends a Carrier Closed event (E87).						
3	(Carrier is undocked.)	---	---	Equipment undocks the carrier from Internal FIMS port.						
Carrier Movement to Store Location										
4	(Carrier Movement in Internal Buffer.)	---	---	Equipment moves the carrier to a store location. <i>Note 1</i> The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s)	---	---	---	IVO	SVO	NA or IA
The carrier at the store location waits completion of processing if it is IN ACCESS. The carrier at the store location waits processing start if it is NOT ACCESSED.										

3.2 Carrier Unload Transfer Scenario

This section assumes that a carrier moves within the Equipment in the following order:

- (1) Carrier Movement to Store Location
- (2) Internal FIMS Port
- (3) Carrier Movement to Store Location
- (4) Load Port

The Carrier Unload Transfer Scenarios for the Internal Buffer Equipment are classified into three main parts, Carrier Movement to Internal FIMS, Carrier Close , and Carrier Unload Transfer, as illustrated in the following flow chart.



- Carrier Movement to Internal FIMS (Equipment dependent)

The first part is the scenario from carrier movement from the carrier store location to the Internal FIMS port and Carrier Open. This scenario may be required for some Equipment specifications. Generally, this part has no variation.

- Carrier Close

The second part is the scenario from Carrier Close to Carrier Complete. Generally, this part has no variation.

- Carrier Unload Transfer

The last part is the scenario from Carrier Out to Carrier Unload. Generally, this part has no variation.

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.2.1 Carrier Movement to Internal FIMS Port

This scenario describes a situation where after the carrier moves from the carrier store location to the Internal FIMS port, the carrier door is opened. This scenario may be required for some Equipment structures and Equipment specifications.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier is at a Store Location in Internal Buffer.) <i>Note 1</i> Load Port Transfer State, Load Port Reservation State and Load Port/Carrier Association State are not related to the carrier in this scenario.	---	---	---	IVO	SVO	IA
Carrier Movement To Internal FIMS Port										
1	(Carrier movement to Internal FIMS port.)	---	---	Equipment moves the carrier to Internal FIMS port. <i>Note 1</i> The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s).	---	---	---	IVO	SVO	IA
Carrier Dock										
2	(The carrier is docked.)	---	---	Equipment docks the carrier to Internal FIMS port. <i>Note 1</i> The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s).	---	---	---	IVO	SVO	IA
Carrier Open										
3	(The carrier door is opened.)	---	---	Equipment opens the carrier door at Internal FIMS port.				IVO	SVO	IA
4	Equipment notifies Host that the carrier door has been opened.	H <- E	S6F11/S6F12 (Carrier Opened)	Equipment sends a Carrier Opened event (E87).						

3 Carrier Transfer Scenarios for Internal Buffer Equipment

<i>No.</i>	<i>Host View</i>	<i>Primary Direction</i>	<i>SECS Message (SECS Desc)</i>	<i>Equipment Action & Behavior</i>	<i>LPTS</i>	<i>LRS</i>	<i>LCAS</i>	<i>CIDS</i>	<i>CSMS</i>	<i>CAS</i>
Go to section 3.2.2, Carrier Close.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.2.2 Carrier Close

This scenario describes a situation from the substrates returning to the carrier to carrier movement to a store location.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier door is already opened at Internal FIMS port) <i>Note 1</i> <i>Load Port Transfer State, Load Port Reservation State and Load Port/Carrier Association State are not related to the carrier in this scenario.</i>	---	---	---	IVO	SVO	IA
Substrate storage										
1	(All substrates return to the carrier.)	---	---	Equipment returns all substrates to the carrier as specified by the Control Job.	---	---	---	IVO	SVO	IA
Carrier Completion										
2	(The carrier door is closed.)	---	---	Equipment closes the carrier door. (1) CAS transitions to CARRIER COMPLETE via transition #19.	---	---	---	IVO	SVO	CC
3	Equipment notifies Host that the carrier door has been Closed.	H <- E	S6F11/S6F12 (Carrier Closed)	Equipment sends a Carrier Closed event (E87).						
	Equipment notifies Host that the carrier has completed.	H <- E	S6F11/S6F12 (CARRIER COMPLETE)	Equipment sends a state transition event, CARRIER COMPLETE.						
4	(Carrier is undocked.)	---	---	Equipment undocks the carrier from Internal FIMS port. <i>Note 1</i> <i>The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s).</i>						
Carrier Movement to Store Location										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
5	(Carrier Movement in Internal Buffer.)	---	---	Equipment moves the carrier to a store location. And then, Equipment waits a CarrierOut service from Host. <i>Note 1</i> <i>The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s).</i>	---	---	---	IVO	SVO	CC
Go to section 3.2.3, Carrier Unload Transfer.										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

3.2.3 Carrier Unload Transfer

This scenario describes a situation from Carrier Out to Carrier Unload.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
0	-----	-----	-----	(The carrier is at a Store Location.)	RTL	NR	NA	IVO	SVO	CC
Carrier Out										
1	Host sends a Carrier Out service to move out the carrier from Internal Buffer.	H -> E	S3F17/S3F18 (Carrier Out)	Equipment initiates carrier out operation. Equipment begins carrier out operation.. (1) LPTS transitions to TRANSFER BLOCKED via Transition #6. Equipment reserves the load port for the carrier out operation. (1) LRS transitions to RESERVED via Transition #2. Equipment associates the load port with the carrier. (1) Load Port/Carrier Association State (LCAS) transitions to ASSOCIATED via Transition #2.	TB	R	A	IVO	SVO	CC
2	Equipment notifies Host that the carrier out operation has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
	Equipment notifies Host that the load port has been reserved for the carrier out operation.	H <- E	S6F11/S6F12 (RESERVED)	Equipment sends a state transition event, RESERVED.						
	Equipment notifies Host that the load port has been associated with the carrier.	H <- E	S6, F11/F12 (ASSOCIATED)	Equipment sends a state transition event, ASSOCIATED.						

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
3	(The carrier is moved to the delivery position.)	---	---	Equipment moves the carrier to the delivery position at load port. (1) LPTS transitions to READY TO UNLOAD via Transition #9. <i>Note 1</i> <i>The carrier location may change. If carrier location changes, Carrier Location Change event(s) is sent corresponding to location change(s)</i> Equipment clears the load port reservation. (1) LRS transitions to NOT RESERVED via Transition #3.	RTU	NR				
4	Equipment notifies Host that the load port has been ready for unload transfer.	H <- E	S6F11/S6F12 (READY TO UNLOAD)	Equipment sends a state transition event, READY TO UNLOAD.						
	Equipment notifies Host that the load port reservation has expired at the load port.	H <- E	S6F11/S6F12 (NOT RESERVED)	Equipment sends a state transition event, NOT RESERVED.						
5	Host sends a ChangeAccess service with the value of AUTO to secure successful Carrier Transfer via AMHS.	H -> E	S3F27/S3F28 (ChangeAccess)	Equipment accepts the ChangeAccess service. (1) If the load port is already AUTO, the equipment returns a positive reply. (The Access Mode of the load port remains AUTO.) (2) If the load port is MANUAL, the equipment returns a positive reply and the Access Mode state transitions to AUTO via Transition #2.						
6	(Only if the Access Mode transitions to AUTO.) Equipment notifies Host that the load port is available for AMHS transfer.	H <- E	S6F11/S6F12 (AUTO)	Equipment sends a state transition event, AUTO, if a state transition occurs in Access Mode State.						
Carrier Unload Transfer										

3 Carrier Transfer Scenarios for Internal Buffer Equipment

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	LPTS	LRS	LCAS	CIDS	CSMS	CAS
7	(AMHS arrives the load port and Carrier Load Transfer begins.)	---	---	Equipment begins carrier unload transfer sequence. (1) LPTS transitions to TRANSFER BLOCKED via Transition #7.	TB	NR	A	IVO	SVO	CC
8	Equipment notifies Host that the carrier transfer has been started.	H <- E	S6F11/S6F12 (TRANSFER BLOCKED)	Equipment sends a state transition event, TRANSFER BLOCKED.						
9	(Carrier Unload Transfer completes.)	---	---	Equipment deletes the carrier object and clears the load port/carrier association. (1) Carrier State transition to no state via transition #21. (2) LPTS transitions to READY TO LOAD via Transition #8. (3) LCAS transitions to NOT ASSOCIATED via Transition #3. <i>Note 1</i> <i>Substrate Objects (E90) are deleted at Carrier Unloading and state transition events of Substrate State model are reported.</i>	RTL		NA	no state	no state	no state
10	Equipment notifies Host that the carrier object has been deleted.	H <- E	S6, F11/F12 (no state)	Equipment sends a state transition event, no state.						
	Equipment notifies Host that the load port is available for load transfer.	H <- E	S6, F11/F12 (READY TO LOAD)	Equipment sends a state transition event, READY TO LOAD.						
	Equipment notifies Host that the load port/carrier association has been cleared.	H <- E	S6, F11/F12 (NOT ASSOCIATED)	Equipment sends a state transition event, NOT ASSOCIATED.						
	Equipment notifies Host of material (i.e. carrier) departure from the load port.	H <- E	S6F11/S6F12 (Material Removed)	Equipment sends a Material Removed event (E30).						
The load port is available for Carrier Load Transfer.										

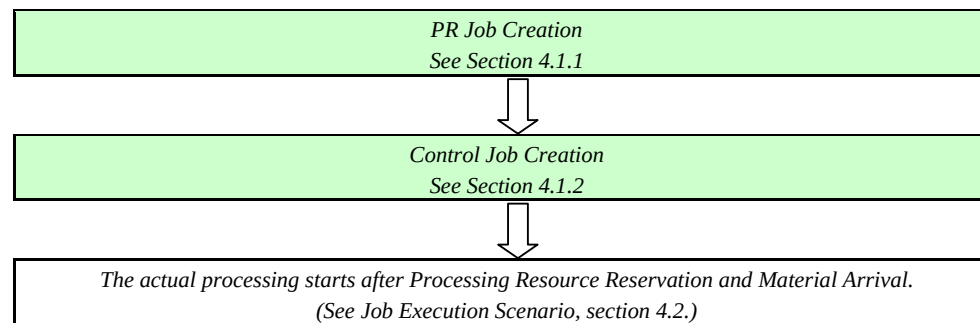
4 Processing (Job Creation and Execution)

This chapter describes Processing Scenarios; Section 4.1 describes Job Creation Scenarios and Section 4.2 describes Job Execution Scenarios.

In order to provide the common host view, the processing scenarios in this chapter are generalized without considering a material type (PRMtlType) of a PR Job and a material destination (MtrlOutByStatus) of a Control Job. These are configured when a Job is created.

4.1 Job Creation Scenario

The Job Creation Scenarios are classified into two main parts, PR Job(s) Creation, and Control Job Creation, as illustrated in the following flow chart.



- PR Job Creation

The first part is the scenario of PR Job creation. Also, multiple PR Jobs can be created, by repeating this scenario.

- Control Job Creation

The second part is the scenario of Control Job creation. Required PR Job(s) is linked to a Control Job in this scenario.

4.1.1 PR Job Creation

This scenario describes PR Jobs creation.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	PJS	CJS	CAS
0	-----	-----	-----	----	no state	no state	----
PR Job Creation							
1	Host issues PRJobMultiCreate service. <i>Note 1</i> <i>Although PRJob can be also created by PRJobCreateEnh service (S16F11/F12), the PR Job is created by using PRJobMultiCreate service in this scenario, since PRJobMultiCreate service covers the function of PRJobCreateEnh service.</i>	H -> E	S16F15/S16F16 (PRJob-MultiCreate)	Equipment creates the PR Job(s). (1) PJS transitions to QUEUED/POOLED via transition #1 <i>Note 1</i> <i>PR Job start method is set to Automatic in this scenario.</i>	Q/P	no state	----
2	Equipment notifies Host that the PR Job(s) has been created.	H <- E	S6F11/S6F12 (QUEUED/POOLED)	Equipment sends a state transition event, QUEUED/POOLED.			
Go to section 4.1.2, Control Job Creation.							

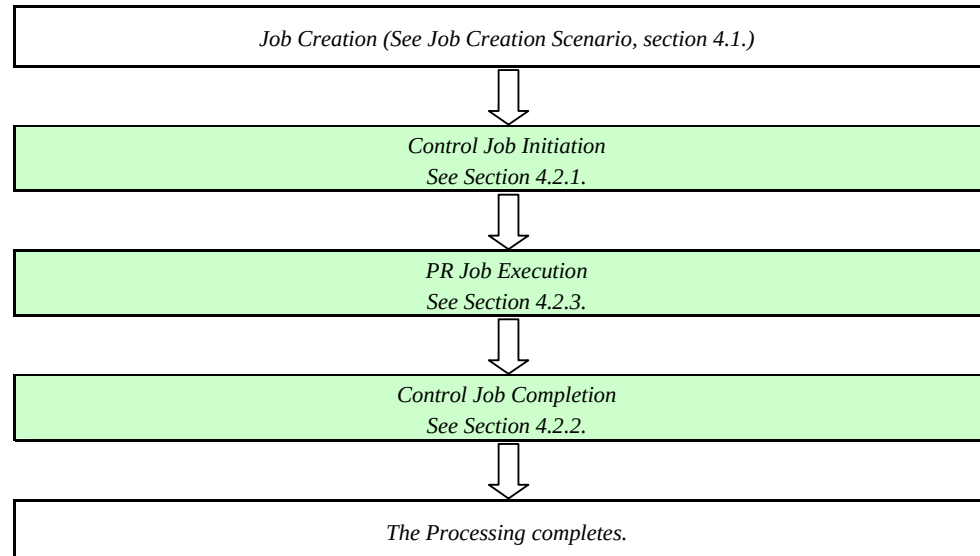
4.1.2 Control Job Creation

This scenario describes Control Job creation.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	PJS	CJS	CAS
0	----	----	----	(The PR Job(s) to be linked is already created.)	Q/P	no state	----
Control Job Creation							
1	Host issues Create Object service.	H -> E	S14F9/S14F10 (Create Object)	Equipment creates the Control Job. (1) CJS transitions to QUEUED via transition #1. <i>Note 1</i> <i>Equipment rejects the Create Object service if the PR Jobs (to be linked) do not exist.</i> <i>Note 2</i> <i>Control Job start method is set to Automatic in this scenario.</i>	Q/P	Q	----
2	Equipment notifies Host that the Control Job has been created.	H <- E	S6F11/S6F12 (QUEUED)	Equipment sends a state transition event, QUEUED.			
Go to section 4.2.1, Control Job Initiation.							

4.2 Job Execution Scenario

The Job Execution Scenarios are classified into three main parts, Control Job Initiation, Associated PR Job Execution, and Control Job Completion, as illustrated in the following flow chart.



- Control Job Initiation

The first part is the scenario of the Control Job initiation.

- PR Job Execution

The second part is the scenario of the initiation, execution, and completion of PR Job(s) associated with a Control Job. This scenario applies to each PR Job.

- Control Job Completion

The last part is the scenario of the Control Job completion. This scenario starts when all PR Jobs that associated to a Control Job are completed.

4.2.1 Control Job Initiation

This scenario describes Control Job initiation.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	PJS	CJS	CAS
0	-----	-----	-----	(The Control Job is at the head of queue. And Control Job start method is set to Automatic.)	Q/P	Q	NA
Control Job SELECTED							
1	(Control Job Selected)	-----	-----	Equipment reserves a process resource for the first PR Job of the Control Job. (1) CJS transitions to SELECTED via Transition #3.	Q/P	S	NA
2	Equipment notifies Host that the processing resource has been reserved for the first PR Job that is associated the Control Job.	H <- E	S6F11/S6F12 (SELECTED)	Equipment sends a state transition event, SELECTED.			
Control Job Start							
3	(The materials for the first PR Job have been arrived.) <i>Note 1</i> <i>See section 2.1.5, 2.1.6, 3.1.5 and 3.1.6 for material arrival.</i>	-----	-----	Equipment starts to execute the Control Job and makes the Carrier IN ACCESS. (1) CJS transitions to EXECUTING via transition #5. (2) CAS transitions to IN ACCESS via transition #18.	Q/P	E	IA
4	Equipment notifies Host that processing by the Control Job has been started.	H <- E	S6F11/S6F12 (EXECUTING)	Equipment sends a state transition event, EXECUTING.			
	Equipment notifies Host that carrier access has been started.	H <- E	S6F11/S6F12 (IN ACCESS)	Equipment sends a state transition event, IN ACCESS.			
5	(Associated PR Jobs initiation and execution)	-----	-----	Equipment initiates the first PR Jobs in the order defined by ProcessOrderMgmt attribute.			
Go to section 4.2.2, Control Job Completion. (See Section 4.2.3 for the details of PR Job execution.)							

4.2.2 Control Job Completion

This scenario describes Control Job completion.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	PJS	CJS	CAS
0	-----	-----	-----	(All PR Jobs associated with the Control Job have terminated.)	no state	E	IA
Control Job Completion							
1	(PR Jobs termination.)	-----	-----	All PR Jobs associated with the Control Job terminated. (1) CJS transitions to COMPLETED via transition #10. <i>Note 1</i> <i>After Control Job termination, the Carrier completes appropriately.</i> <i>See section 2.2.1 and 3.2.2 Carrier Close Scenario for Carrier Completion.</i>	----	C	CC
2	Equipment notifies Host that processing by the Control Job has been completed.	H <- E	S6F11/S6F12 (COMPLETED)	Equipment sends a state transition event, COMPLETED.			
Control Job Termination							
3	(Control Job extinction).	---	---	Equipment deletes the Control Job. (1) CJS transitions to no state via transition #13.	----	no state	CC
4	Equipment notifies Host that the Control Job is deleted.	H <- E	S6F11/S6F12 (deleted)	Equipment sends a state transition event, no state.			
The Control Job has been deleted.							

4.2.3 PR Job Execution

This scenario describes PR Job initiation and execution. This scenario applies to each PR Job.

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	PJS	CJS	CAS
0	-----	-----	-----	(PR Job start method is set to Automatic.)	Q/P	----	----
PR Job Initiation							
1	(PR Job Start)	-----	-----	The Control Job initiates the associated PR Job. And then Equipment starts preconditioning of the processing resource if required. (1) PJS transitions to SETTING UP via transition #2.	SU	----	----
2	Equipment notifies Host that the processing resource has been assigned for the PR Job and required pre-conditioning has been started.	H <- E	S6F11/S6F12 (SETTING UP)	Equipment sends a state transition event, SETTING UP.			
3	(The processing resource completes preconditioning.)	---	---	Equipment starts the PR Job. (1) PJS transitions to PROCESSING via transition #4	P		
4	Equipment notifies Host that processing by the PR Job has been started.	H <- E	S6F11/F12 (PROCESSING)	Equipment sends a state a transition event, PROCESSING.			
PR Job Completion							
5	(The processing in the process resource, i.e. the process part of Equipment, completes.)	---	---	The PR Job completes. (1) Post conditioning is started for the process resource, if required. (2) PJS transitions to PROCESSING COMPLETE via transition #6. <i>Note 1</i> <i>Post conditioning is performed after the last substrate of the PR Job is removed from the process resource.</i>	PC	----	----

4 Processing (Job Creation and Execution)

No.	Host View	Primary Direction	SECS Message (SECS Desc)	Equipment Action & Behavior	PJS	CJS	CAS
6	Equipment notifies Host that actual processing on the material has been completed.	H <- E	S6F11/S6F12 (PROCESS COMPLETE)	Equipment sends a state transition event, PROCESS COMPLETE.			
7	(All material has been removed from the process resource, i.e. the process part of Equipment, and post conditioning has completed.)	---	---	Equipment deletes the PR Job. (1) PJS transitions to no state via transition #7.	no state		
8	Equipment Notifies Host that the PR Job has been deleted.	H <- E	S6, F11/S6F12 (deleted)	Equipment sends a state transition event, no state.			
Go to 4.2.2, Control Job Completion.							