# *Communication specifications for AMHS Reticle-Stocker Interface*

## *Real-time Communication and Scenarios between MCS and SCS*

*Version v1.0.1*

# Document Revision History

| Date | Version | Modifier | Comment |
|---|---|---|---|
| 2026/07/07 | 1.0 | Flowsoft | Document Initial |
| 2026/07/15 | 1.0.1 | Flowsoft | 4.3.1.1 Scenario modification<br>RPT 14. add CommandID |
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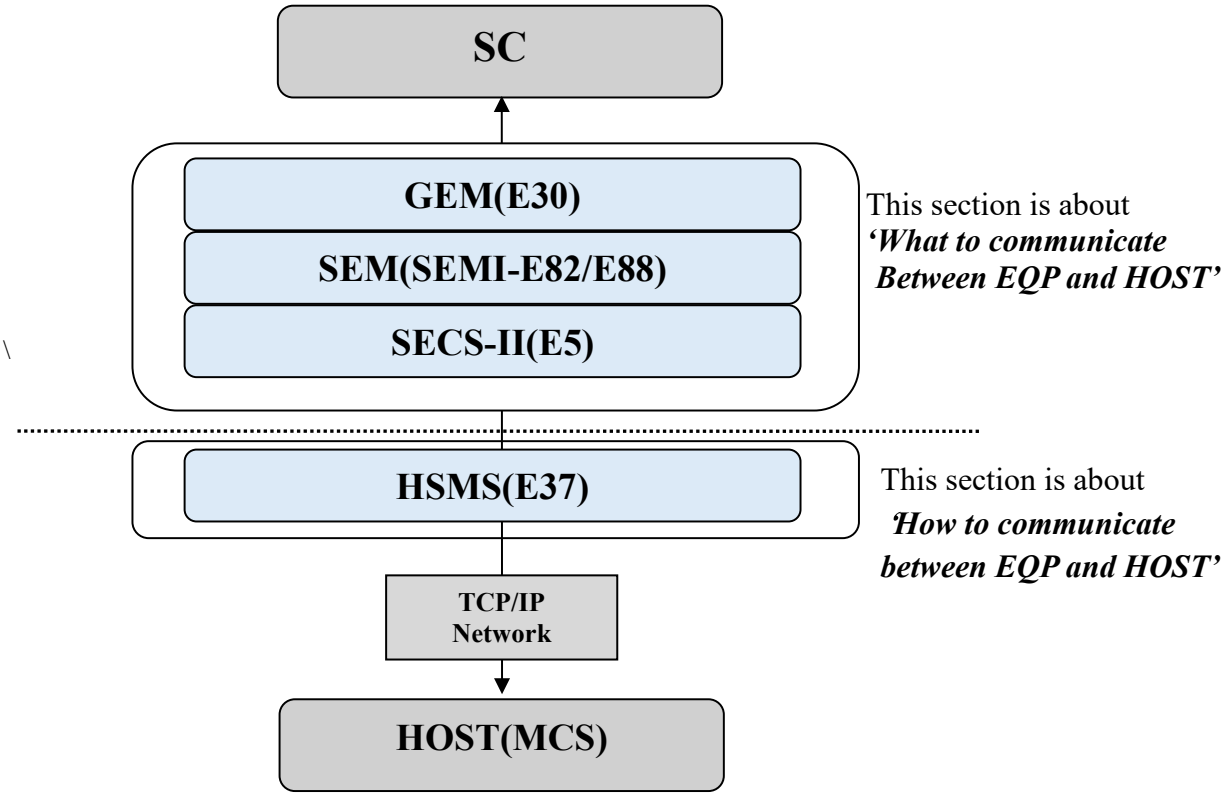
# 1. Introduction to SEMI E30 GEM

SEMI E30 GEM, also known as the Generic Equipment Model, is a communication standard designed to facilitate consistent and reliable interaction between semiconductor equipment and host software. The following section outlines its scope and the goals it aims to achieve.

## 1.1. Scope

The SEMI E30 GEM(GENERIC EQUIPMENT MODEL) standard focuses on defining how semiconductor equipment behaves when communicating over a link with a host system. While the SEMI E5 (SECS-II) standard defines the structure and types of messages exchanged between the host and equipment, GEM specifies which SECS-II messages to use, when to use them, and how the equipment should respond to these messages.

Importantly, GEM does not define how the host should behave; the host can initiate any communication at any time, and the equipment must react according to GEM's rules.



## 1.2. Intent

GEM establishes a standardized implementation of SECS-II specifically for semiconductor manufacturing equipment. It provides a common set of behaviors and communication features to support factory automation for device manufacturers.

- Equipment suppliers can add extra SECS-II features beyond GEM as long as these additions don't conflict with the GEM standard. Examples include new message types, alarms, commands, or state variables tailored to specific equipment types like etchers or steppers.
- Device manufacturers benefit from having a consistent interface across different equipment, which simplifies software development and reduces integration costs.
- The standard helps both suppliers and manufacturers save money and improve factory automation efficiency.
- GEM also provides enough flexibility for manufacturers to implement custom automation solutions while remaining within an industry-wide framework.

The GEM standard aims to specify:

- A behavioral model for semiconductor equipment within a SECS-II communication environment.
- Essential control and information functions required in semiconductor manufacturing.
- The basic communication capabilities that all semiconductor equipment should support using SECS-II.
- A unified method for executing actions when SECS-II allows multiple approaches.
- Standard message sequences (dialogues) to enable effective communication.

## 1.3. Communication State

The equipment's communication state model, as defined in SEMI E30, is divided into two main states:

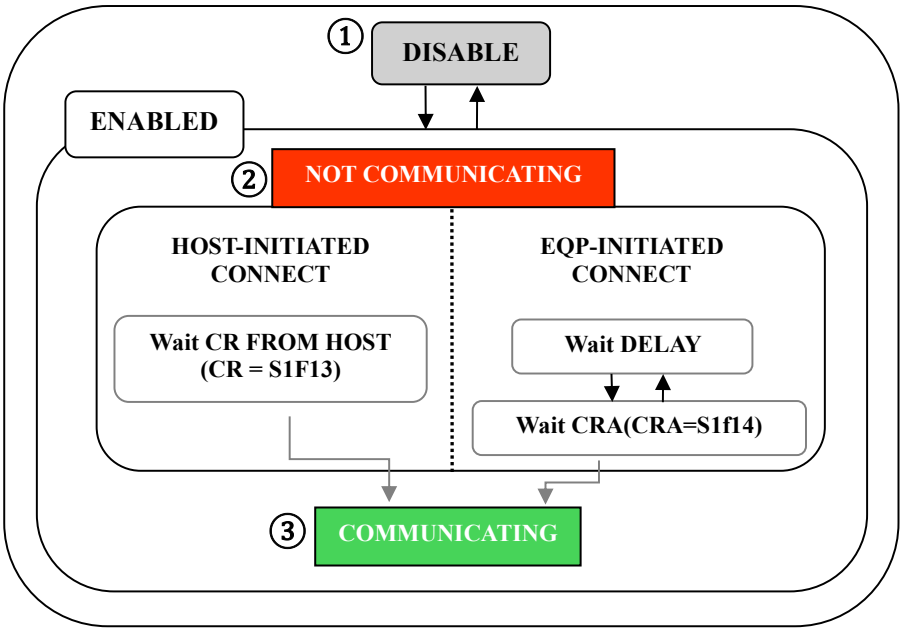
- DISABLED
- ENABLED

When ENABLED, it includes two substates:

- NOT COMMUNICATING
- COMMUNICATING

### 1.3.1. Communication State Diagram

*Communication State Diagram* shows how the equipment and host establish and maintain SECS-II communication.




#### ① DISABLED

In this state SECS-II communication with a host computer is non-existent. If the operator switches from ENABLED to DISABLED, all SECS-II communications must cease immediately. Any messages queued to send shall be discarded, and all further action on any open transactions and conversations shall be terminated.
Handling of messages currently being transmitted is an issue for lower level message transfer protocols and is not addressed in this standard.
The DISABLED state is a possible system default.

#### ② ENABLED / NOT COMMUNICATING

No messages other than S1,F13, S1,F14, and S9,Fx shall be sent while this substate is active. The equipment shall discard any messages received from the host other than S1,F13 or S1,F14 (Establish Communications Acknowledge). It shall also periodically attempt to establish communication with a host computer by issuing an S1,F13 until communications are successfully established. However, only one equipment-initiated S1,F13 transaction may be open at any time.

This state has two concurrent (AND-type) substates:

- EQUIPMENT-INITIATED CONNECT: The equipment tries to connect.
    - WAIT CRA: Waiting for the host to respond (after sending S1,F13).
    - WAIT DELAY: Waiting before retrying after a failure.
- HOST-INITIATED CONNECT: The host attempts connection.
    - WAIT CR FROM HOST: The equipment waits for an S1,F13 from the host and replies with S1,F14.

**③ ENABLED / COMMUNICATING**

- Communications have been established.
- The equipment may receive any message from the host, including S1,F13
- When the equipment is COMMUNICATING, SECS communications with a host computer must be maintained.
- If either side sends another S1,F13, the other should respond with S1,F14 (COMMACK = 0).
- If a communication fault occurs (e.g., timeout), the system returns to NOT COMMUNICATING.

⚠ Even if both sides send S1,F13 simultaneously, either successful transaction will transition the system into COMMUNICATING. The other transaction remains open until it finishes normally.

### 1.3.2. SECS/GEM Communication – Connection Mode Overview

In SECS/GEM communication, establishing a TCP/IP connection involves two distinct roles, determined by the connection mode configuration:

**① Active Mode**

- This entity is responsible for initiating the TCP/IP connection.
- It actively attempts to establish a session by sending a connection request to the remote counterpart.
- The Active Mode Entity does not wait for incoming connections — it starts the process by reaching out to the Passive Mode Entity.

**② Passive Mode**

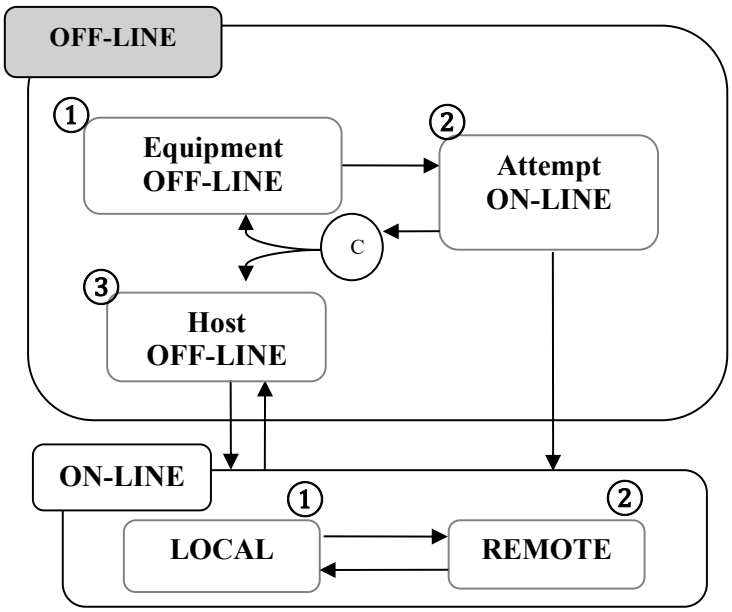
- This entity operates in listening mode.
- It waits for an external connection request, typically from an Active Mode Entity.
- The Passive Mode Entity keeps a server socket open and remains ready to accept incoming connections initiated by an external client.

## 1.4. Control State

- CONTROL state model defines the level of cooperation between the host and equipment
- Unlike the COMMUNICATIONS model, which covers whether messages can be exchanged, this model addresses whether the equipment will act on received messages.
- There are three levels:
    1. **REMOTE** – Full host control over equipment
    2. **LOCAL** – Host has information access but limited control
    3. **OFF-LINE** – No host control, minimal information access
- CONTROL and COMMUNICATION states do not directly affect each other, but if COMMUNICATION is NOT COMMUNICATING, then messages (and therefore control) won't work effectively.

### 1.4.1. Control State Diagram

*Control State Diagram* explains the equipment's operational control modes (e.g., Offline, Online Local, Online Remote)




### 1.4.2. Control State: OFF-LINE

When the OFF-LINE state is active, operation of the equipment is performed by the operator at the operator console. While the equipment is OFF-LINE, message transfer is possible. However the use of messaging for any automation purpose is severely restricted. While the OFF-LINE state is active, the equipment will only respond to those messages used for the establishment of communications or a host request to activate the ON-LINE state.

While OFF-LINE, the equipment will respond with an Sx,F0 to any primary message from the host other than S1,F13 or S1,F17.No message spooling occurs in this state. OFF-LINE consists of three substates:

**① OFF-LINE / EQUIPMENT OFF-LINE**

- While this state is active, the system maintains the OFF-LINE state
- It awaits operator instructions to attempt to go ON-LINE.

**② OFF-LINE / ATTEMPT ON-LINE**

- Operator has initiated an ONLINE attempt.
- Equipment sends S1,F1 to the host.
- Operator cannot switch states manually during this substate.

**③ OFF-LINE / HOST OFF-LINE**

- the operator's intent is that the equipment be ON-LINE. However, the host has not agreed.
- While this state is active, the equipment shall positively respond to any host's request to go ON-LINE (S1,F17)..

### 1.4.3. Control State: ON-LINE

SECS-II messages may be exchanged and acted upon. Capabilities that may be available to the host should be similar to those available from the operator console wherever practical. The use of Sx,F0 messages is not required while the ON-LINE state is active. Their use is discouraged in this case. The only allowed use is to close open transactions in conjunction with message faults.

**① ON-LINE / LOCAL**

- The host shall be prohibited from the use of remote commands that cause physical movement or which initiate processing. During processing, the host shall be prohibited from the use of any remote command that affects that process.
- During processing, the host shall be prohibited from modifying any equipment constants that affect that process. Other equipment constants shall be changeable during processing. The host shall be able to modify all available equipment constants when no processing is in progress.
- The host shall be capable of initiating the upload and download of recipes to/from the recipe storage area on the equipment. The host shall be capable of selecting recipes for execution so long as this action does not affect any currently executing recipe.
- The host shall be able to configure automatic data reporting capabilities including alarms, event reporting, and trace data reporting. The host shall receive all such reports at the appropriate times.

- The host shall be able to inquire for data from the equipment, including status data, equipment constants, event reports, Process Recipe directories, and alarms.The equipment shall be able to perform Terminal Services as defined in GEM.

**② ON-LINE / REMOTE**

② For equipment which supports the GEM capability of remote control (see § 4.4), while the REMOTE state is active, the host shall have access, through the communications interface, to the necessary commands to operate the equipment through the full process cycle in an automated manner. The equipment does not restrict any host capabilities when REMOTE is active. The degree of control executed by the host may vary from factory to factory.

③ In some cases, the operator may be required to interact during remotely controlled processes. This interaction may involve set-up operations, operator assist situations, and others. This state is intended to be flexible enough to accommodate these different situations**.**

To support the different factory automation policies and procedures, it shall be possible to configure the equipment to restrict the operator in specific non-emergency procedures. These restrictions shall be configurable so that the equipment may be set up to allow the operator to perform necessary functions without contention with the host. The categories for configuration shall include (but are not limited to):

- change equipment constants (non-process-related),
- initiate Process Recipe download,
- select Process Recipe,
- start Process Recipe,
- pause/resume Process Recipe,
- operator assist,
- material movement to/from equipment, and
- equipment-specific commands (on a command-by-command basis if needed).

No capabilities that are available to the operator when the LOCAL state is active should be unconditionally restricted when the REMOTE state is active. The supplier may provide for configurable restriction of operator capabilities not included in the list above if desired. No configurability is necessary for any operator functions not available to the host.

## 1.5. Reference & Verbs

| No. | Abbreviation | Full Name | Description |
|---|---|---|---|
| 1 | MCS | Material Control System | A system that manages and controls material handling equipment. |
| 2 | AMHS | Automated Material Handling System | Equipment used for storage and transport of materials within a factory. |
| 3 | GEM | Generic Equipment Model | SEMI-defined standard for generic semiconductor equipment operation. |
| 4 | Stocker-SEM | Specification for AMHS Storage Specific Equipment Model | SEMI standard for operating stocker-type storage systems. |
| 5 | IB-SEM | Specification for Interbay / Intrabay AMHS SEM | SEMI standard for operating transport equipment like AGV, OHS. |
| 6 | SC | Stocker Controller | Manages data and controls devices within a stocker. |
| 7 | TSC | Transport System Controller | Controls transport equipment such as AGVs and OHS. |
| 8 | AGV | Automated Guided Vehicle | Automatically delivers materials to destinations by following guide lines. |
| 9 | RGV | Rail Guided Vehicle | Moves along fixed rails to transport materials. |
| 10 | OHS | Overhead Shuttle | Ceiling-mounted shuttle that transports materials along overhead rails. |
| 11 | Lift | (Vertical Transport Unit) | Transfers materials between different floor levels. |
| 12 | LP | Load Port | Port for loading materials for processing or stocker input. |
| 13 | OP | Output Port | Port for dispatching materials for external transport. |
| 14 | BP | Buffer Port | Temporary port for intermediate or special-purpose material storage. |
| 15 | Port | (General Port Interface) | Generic term for LP, OP, BP – material load/unload interface points. |
| 16 | Unit | (Logical/Physical Unit) | General component of AMHS such as crane or shelf. |
| 17 | Crane | Crane Unit | Moves materials horizontally and vertically inside a stocker. |

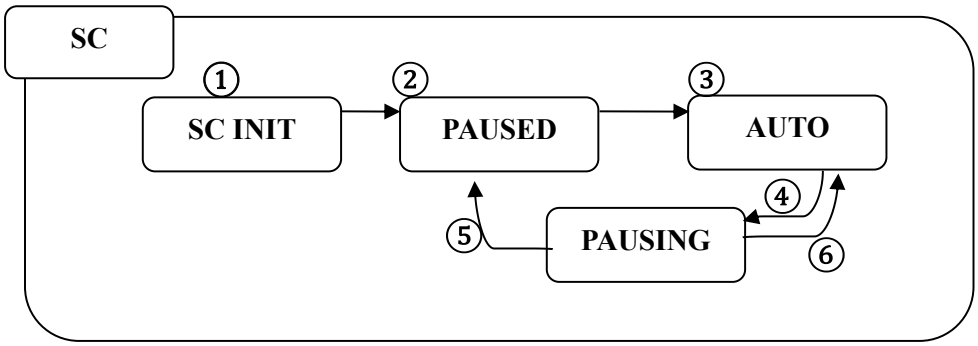
# 2. STK Control Specification (reference to STOCKERSEM)

This standard defines a Specific Equipment Model (SEM) for AMHS storage equipment (Stocker SEM), extending SEMI E30 requirements. It specifies the operational model and host interface (control, state models, data reports) to support integration into automated factories (e.g., semiconductor, FPD). The scope also includes queuing, carrier transfer interface (SEMI E23), controller architecture, and scheduling/transport of transfer units.

## SC State Model

The purpose of the SC state model is to provide information to the host regarding the overall status of the stocker system. The SC state model is valid when the SEMI E30 (GEM) state is ON-LINE. The SC state model is not valid when the SEMI E30 (GEM) state is OFF-LINE. Since a stocker may consist of many components (e.g., stocker crane, conveyor, ID reader, etc.) it may be possible to continue ON-LINE operation when the operation mode of some stocker components (as viewed by the SC) is a manual state. The details of what happens when individual components of the stocker enter a manual state are specific to the Stocker SEM equipment supplier.

### 2.1.1. SC State Model Diagram




**① SC INIT**

SC initialization of stocker components is occurring. This is a non-operational state. No commands from the host will be acknowledged, queued or processed. The system will not move out of this state if there are carriers moving on any of the stocker units controlled by the SC. Such devices must be manually or automatically recovered before transitioning to the next state.

**② PAUSING**

A system PAUSE command has been received and is being processed. All carriers that are currently moving will continue until their physical movement stops (their transfer command may still be active). Carriers that are currently moving may continue to move but they must not begin another movement. TRANSFER commands are accepted and queued. All status requests will be processed. The RESUME, INSTALL and REMOVE commands will also be processed.

**③ PAUSED**

No carriers are in the process of moving on any of the stocker units controlled by the

SC. Carriers may be at any port position including the OP, BP, and LP positions. TRANSFER commands are accepted and queued. All status requests will be processed. The RESUME, INSTALL and REMOVE commands will also be processed.

④ **AUTO**

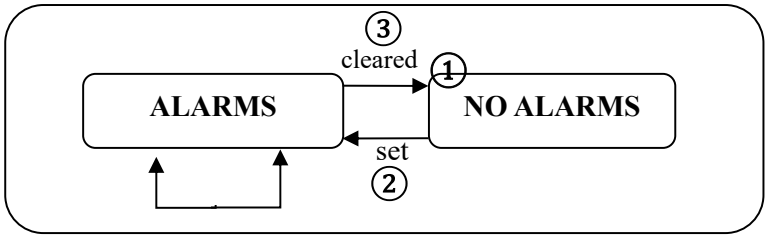
Stocker is in the normal operational state. Commands are actively processed

### 2.1.2. SC State Transition Table

| No. | Previous State | Trigger | New State | Actions | Comments |
|---|---|---|---|---|---|
| 1 | None | SC Initiation | SC Init | S6F11<br>SCAutoInitiated | |
| 2 | SC INIT | System started up successfully. All Carrier movement stopped | PAUSED | S6F11<br>SCPaused | |
| 3 | PAUSED | RESUME command | AUTO | S6F11<br>SCAutoCompleted | |
| 4 | AUTO | PAUSE command | PAUSING | S6F11<br>SCPauseInitiated | |
| 5 | PAUSING | RESUME command | AUTO | S6F11<br>SCAutoCompleted | |
| 6 | PAUSING | All Carrier movement has completed | PAUSED | S6F11<br>SCPauseCompleted | |

## 2.2. Alarm State Model

### 2.2.1. Alarm State Model Diagram




**① NO ALARMS**

The system is in a normal state with no active alarms.

- All equipment and operations are functioning properly.

**② ALARMS** (after Alarm Set)

System can process normally for transport components that are unaffected by the alarm

- The *S6F11 Unit Alarm Set* event is sent to the host when an alarm is raised.
- If additional alarms occur, the same message may be sent multiple times.

**③ NO ALARMS (after Alarm Clear)**

All previously set alarms have been cleared, and the system returns to the normal state.

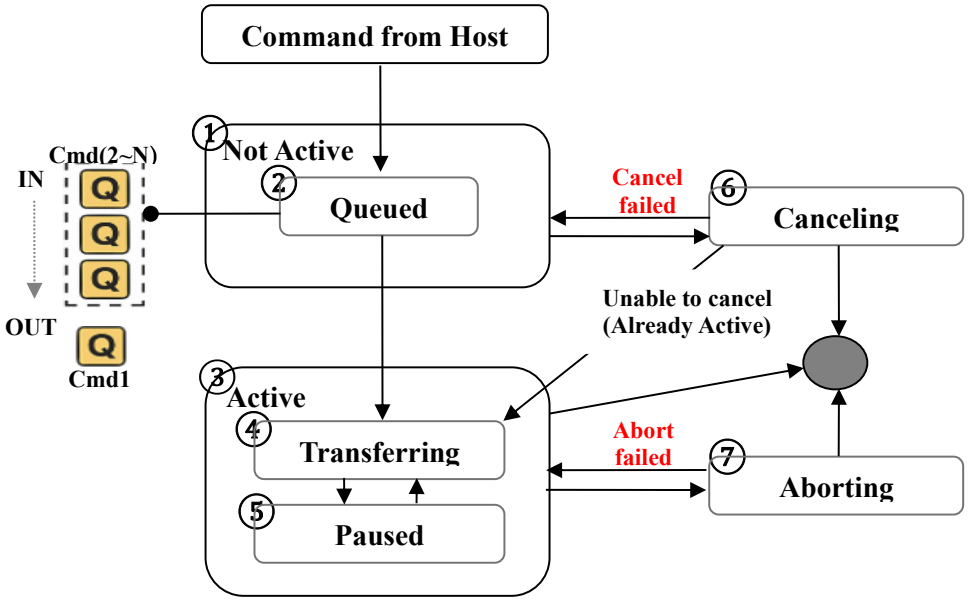
- The *S6F11 Unit Alarm Clear* event is sent to the host upon clearing all alarms.

### 2.2.2. Alarm State Transition Table

| No. | Previous State | Trigger | New State | Actions | Comments |
|---|---|---|---|---|---|
| 1 | NO ALARMS | Alarm Set | ALARMS | S6F11 UnitAlarmSet | |
| 2 | ALARMS | All Alarms cleared | NO ALARMS | S6F11 UnitAlarmCleared | |
| 3 | ALARMS | Alarm Set | ALARMS | S6F11 UnitAlarmSet | |

## 2.3. Transfer Command State Model

### 2.3.1. Transfer Command State Model Diagram




① **Not Active**

The transfer unit is not involved in the physical aspect of the TRANSFER command.

• This is the initial or idle state before any action is taken.

② **Queued** *(Sub-state of Not Active)*

SC has acknowledged and queued the TRANSFER command. TRANSFER command has not been initiated.

③ **Active**

The transfer unit is involved in the physical aspect of the TRANSFER command.

④ **Transferring** *(Sub-state of Active)*

The transfer command is actively being executed by the transport equipment.

⑤ **Paused** *(Sub-state of Active)*

The transfer command is not actively being executed by the transport equipment.

• The SC pauses execution of the TRANSFER command due to an anomaly condition.

⑥ **Canceling**

The TRANSFER command cancel procedure is being performed to terminate a transfer command which never entered the ACTIVE state (QUEUED). This state is entered via a CANCEL remote command.

• Host issued cancel for the TRANSFER command is accepted by the SC.

• A CANCEL remote command was issued to terminate a TRANSFER command that has not entered the physical aspect of the command.

⑦ **Aborting**

The TRANSFER command abort procedure is being performed to terminate a transfer command which has entered the ACTIVE state. This state can only be entered via an ABORT remote command.

• Host initiates an abort of a TRANSFER command.

• An ABORT remote command was issued to terminate a TRANSFER command.

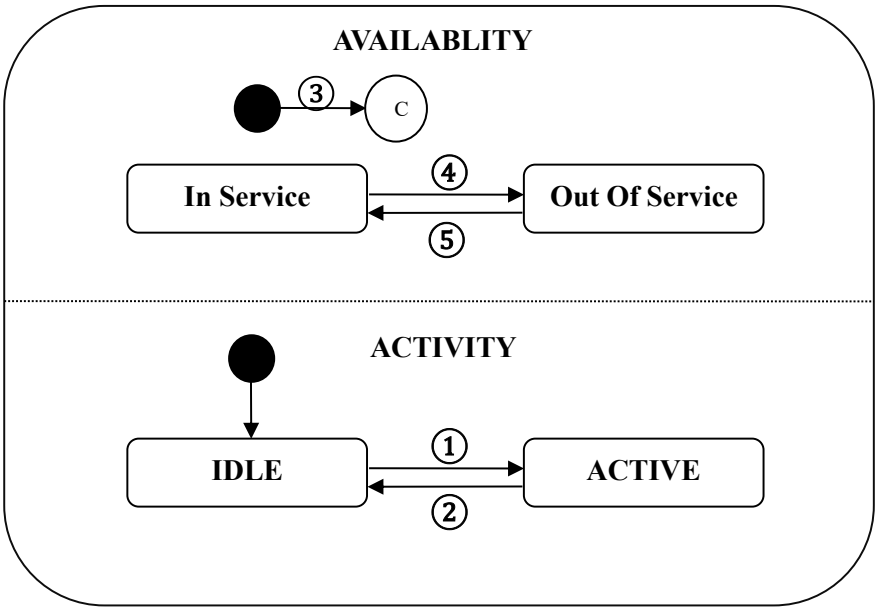
### 2.3.2. Transfer Command State Transition Table

| No | Previous State | Trigger | New State | Actions |
|---|---|---|---|---|
| 1 | QUEUED | The TRANSFER command has been initiated by the SC. | TRANSFERRING | S6F11 TransferInitiated |
| 2 | QUEUED | Host sends CANCEL command for a specified TRANSFER command to SC. | CANCELING | S6F11 TransferCancel Initiated |
| 3 | CANCELING | The cancel procedure for the TRANSFER command has completed by the stocker and the SC. | None | S6F11 TransferCancel Completed |
| 4 | TRANSFERRING | The SC pauses execution of the TRANSFER command due to an anomaly condition. | PAUSED | S6F11 TransferPaused for a specific CommandID |
| 5 | PAUSED | The SC resumes execution of the TRANSFER command since the anomaly condition has been cleared. | TRANSFERRING | S6F11 TransferResumed for a specific CommandID |
| 6 | ACTIVE | The TRANSFER command has completed by the stocker and SC (either successfully or unsuccessfully). | None | S6F11 TransferCompleted sent to Host with appropriate ResultCode |
| 7 | ACTIVE | Host sends ABORT command for a specified TRANSFER command to SC. | ABORTING | S6F11 TransferAbort Initiated |
| 8 | ABORTING | The abort procedure for the TRANSFER command has completed by the stocker and SC. | None | S6F11 TransferAbort Completed |
| 9 | ABORTING | TRANSFER command cannot be aborted. | ACTIVE | S6F11 TransferAbort Failed |
| 10 | CANCELING | Transport system is unable to cancel the TRANSFER command because the transfer is now ACTIVE. | TRANSFERRING | S6F11 Transfer Initiated |
| 11 | CANCELING | Transport system is unable to cancel the TRANSFER command and it is still queued. | QUEUED | S6F11 TransferCancel Failed |

## 2.4. Stocker Crane State Model

The purpose of the stocker crane state model is to provide information to the host for use of stocker crane information and metric tracking (i.e., the Host will not control the stocker crane). Whether it is possible to continue operation while the stocker crane is not operational is specific to the stocker SEM equipment supplier. If a single stocker contains multiple stocker cranes, each stocker crane must comply with the stocker crane state model.

### 2.4.1. Stocker Crane State Model Diagram




**① IDLE**

The stocker crane is not performing Host or SC initiated work.

**② ACTIVE**

The stocker crane is busy performing Host or SC initiated work.

**③ INSERVICE**

The crane is able to perform the movement of carriers. The Active and Idle states are not sub-states of this state because an Active to Idle transition can occur when the crane is 'Out Of Service' due to a command being canceled or aborted.

**④ OUT OF SERVICE**

The crane is not able to perform the movement of carriers. If a command is issued by the Host, it shall not be rejected solely because the crane is in this state. In other words, the state of the crane is not a valid reason to reject a command from the Host.

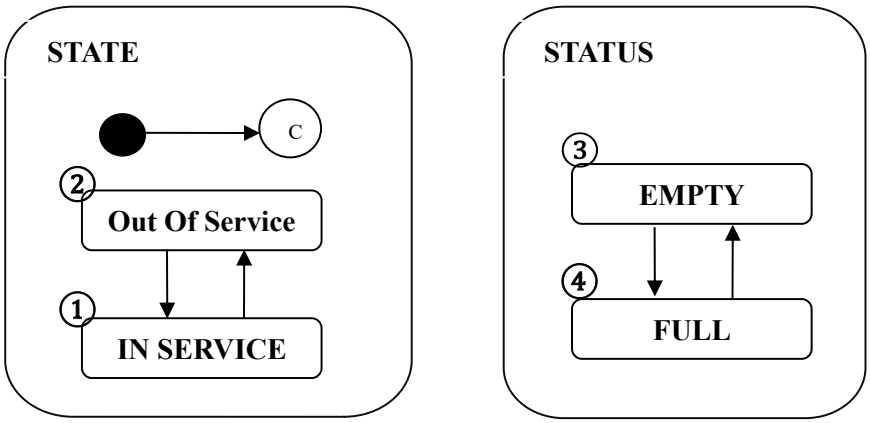
### 2.4.2. Stocker Crane State Transition Table

| No. | Previous State | Trigger | New State | Actions |
|---|---|---|---|---|
| 1 | IDLE | Crane is requested to perform host or SC initiated work. | ACTIVE | S6F11 CraneActive |
| 2 | ACTIVE | Crane completes host or SC initiated work. | IDLE | S6F11 CraneIdle |
| 3 | None | System reset. | OUT OF SERVICE or IN SERVICE | S6F11 UnitStateChanged |
| 4 | IN SERVICE | The equipment has determined that the crane should not be used for transfers. | OUT OF SERVICE | S6F11 UnitStateChanged |
| 5 | OUT OF SERVICE | The equipment has determined that the crane can be utilized for transfers. | IN SERVICE | S6F11 UnitStateChanged |

## 2.5. Stocker Unit State/Status Model

The stocker unit state model is intended to inform the host about unit status and metrics. It is for monitoring purposes only; the host does not control the stocker unit.

### 2.5.1. Unit State/Status Model Diagram




**① INSERVICE**

The unit is able to perform the movement or stacking/splitting of carriers.

**② OUT OF SERVICE**

The unit is not able to perform the movement of carriers. If a command is issued by the Host, it shall not be rejected solely because the unit is in this state. In other words, the state of the unit is not a valid reason to reject a command from the Host

③ **EMPTY**

The stocker unit has no carriers or wafers stored inside. It is completely empty and available to receive new items.

④ **FULL**

The unit inside the stocker is occupied by a carrier, meaning it is currently full

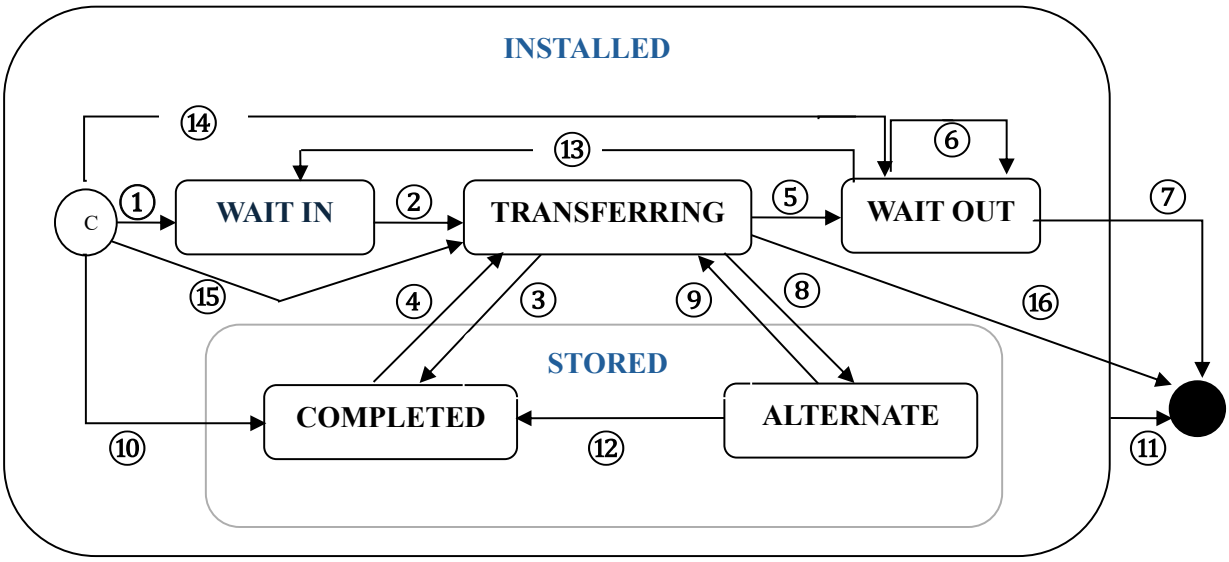
### 2.5.2. Stocker Unit State/Status Transition Table

| No. | Previous State | Trigger | New State | Actions |
|---|---|---|---|---|
| 1 | None | System reset. | OUT OF SERVICE<br>IN SERVICE | S6F11<br>UnitStateChanged |
| 2 | IN SERVICE | The equipment has determined that the stocker unit should not be used for transfers. | OUT OF SERVICE | S6F11<br>UnitStateChanged |
| 3 | OUT OF SERVICE | The equipment has determined that the stocker unit can be utilized for transfers. | IN SERVICE | S6F11<br>UnitStateChanged |
| 4 | EMPTY | The stocker unit has been occupied by a carrier. (The location is Full) | FULL | S6F11<br>UnitStatusChanged |
| 5 | FULL | The carrier has been removed from the stocker unit. (The location is Empty) | EMPTY | S6F11<br>UnitStatusChanged |

## 2.6. Carrier State Model

The purpose of the stocker carrier state model is to provide information to the host regarding carrier tracking (the Host will not control carriers) while the carrier is in the domain of the stocker. The carrier is in the domain of the stocker when it is in storage or transport internal to the stocker or on a stocker interface port (manual, interbay, or intrabay). The equipment shall track each carrier in compliance with the Stocker Carrier State Model.

### 2.6.1. Carrier State Model Diagram




① **INSTALLED** - Carrier in stocker database.

② **WAIT IN** *(INSTALLED sub-state)*

Carrier at final internal port location of the stocker. Carrier is ready to be transferred to storage or output location and no further movement or action should be taken on this carrier prior to transfer.

③ **WAIT OUT** *(INSTALLED sub-state)* - Carrier is at an Output, Buffer, or Loading Port.

④ **TRANSFERRING** *(INSTALLED sub-state)*

Carrier 'moving' between locations in the stocker. The carrier may not be physically moving but may be on the crane (or other position) waiting for a new TRANSFER command as the result of an anomaly condition.

⑤ **STORED** *(INSTALLED sub-state)* - Carrier is sitting at a storage location.

⑥ **COMPLETED** *(STORED sub-state)*

The carrier is stored at a shelf location as a result of completing a transfer for which this shelf represents the destination of the transfer command.

⑦ **ALTERNATE** *(STORED sub-state)*

The carrier is temporarily stored at a shelf location. The transfer command completion is pending until the destination and the crane become available.

### 2.6.2. Carrier State Transition Table

| No. | Previous State | Trigger | New State | Actions |
|---|---|---|---|---|
| 1 | None | Carrier arrives at a Wait In position of the stocker. | WAIT IN | S6F11 CarrierWaitIn |
| 2 | WAIT IN | Stocker is executing a TRANSFER command for the carrier. | TRANSFERRING | S6F11 CarrierTransferring |
| 3 | TRANSFERRING | Completion of a TRANSFER command with a DEST of internal stocker storage. | COMPLETED | S6F11 CarrierStored |
| 4 | COMPLETED | Stocker is executing a TRANSFER command for the carrier. | TRANSFERRING | S6F11 CarrierTransferring |
| 5 | TRANSFERRING | Carrier has arrived at the output port. | WAIT OUT | S6F11 CarrierWaitOut |
| 6 | WAIT OUT | Carrier has advanced (automatically) on a port beyond the output port. | WAIT OUT | S6F11 CarrierWaitOut |
| 7 | WAIT OUT | Carrier is removed from the stocker domain (removed from the output LP). | None | S6F11 CarrierRemoved |
| 8 | TRANSFERRING | The destination of the move command is occupied. | ALTERNATE | S6F11 CarrierStoredAlt |
| 9 | ALTERNATE | The port becomes available and transfer command is first in queue. | TRANSFERRING | S6F11 CarrierResumed (S6F11 TransferResumed in this System) |
| 10 | None | Carrier entry is created or modified in the SC database. | COMPLETED | S6F11 CarrierInstallCompleted |
| 11 | INSTALLED | Carrier entry is removed from the SC database. | None | S6F11 CarrierRemoveCompleted |
| 12 | ALTERNATE | Transfer Command is Aborted | COMPLETE | S6F11 CarrierStored |
| 13 | WAIT OUT | Carrier on a bi-directional port is ready to be moved to a storage or output location. | WAIT IN | S6F11 Carrier Wait In |
| 14 | None | The result of ID read at an output port that did not match the expected ID. | WAIT OUT | S6F11 Carrier Wait Out |
| 15 | None | 1.Carrier created directly on the crane(as the result of duplicate ID recovery).<br>2.Transfer Command received from host with the source being a port with no SC controlled sensors (e.g.directly | TRANSFERRING | S6F11 CarrierTransferring |

| | | | | |
|---|---|---|---|---|
| | | connected process equipment) | | |
| 16 | TRANSFERRING | Carrier has arrived at an Output port and is removed from the stocker domain. | None | S6F11 CarrierRemoved |

## 2.7. ID RULE

### 2.7.1. Command ID

(H/U/C) + Carrier ID + Time(yyyyMMddHHmmssfff)

| System | Prefix | Example |
|---|---|---|
| MES, MCS SERVER | H | HCARRIER0120160904093931123 |
| MCS UI | U | UCARRIER0120160904093931123 |
| STOCKER | C | CCARRIER0120160904093931123 |

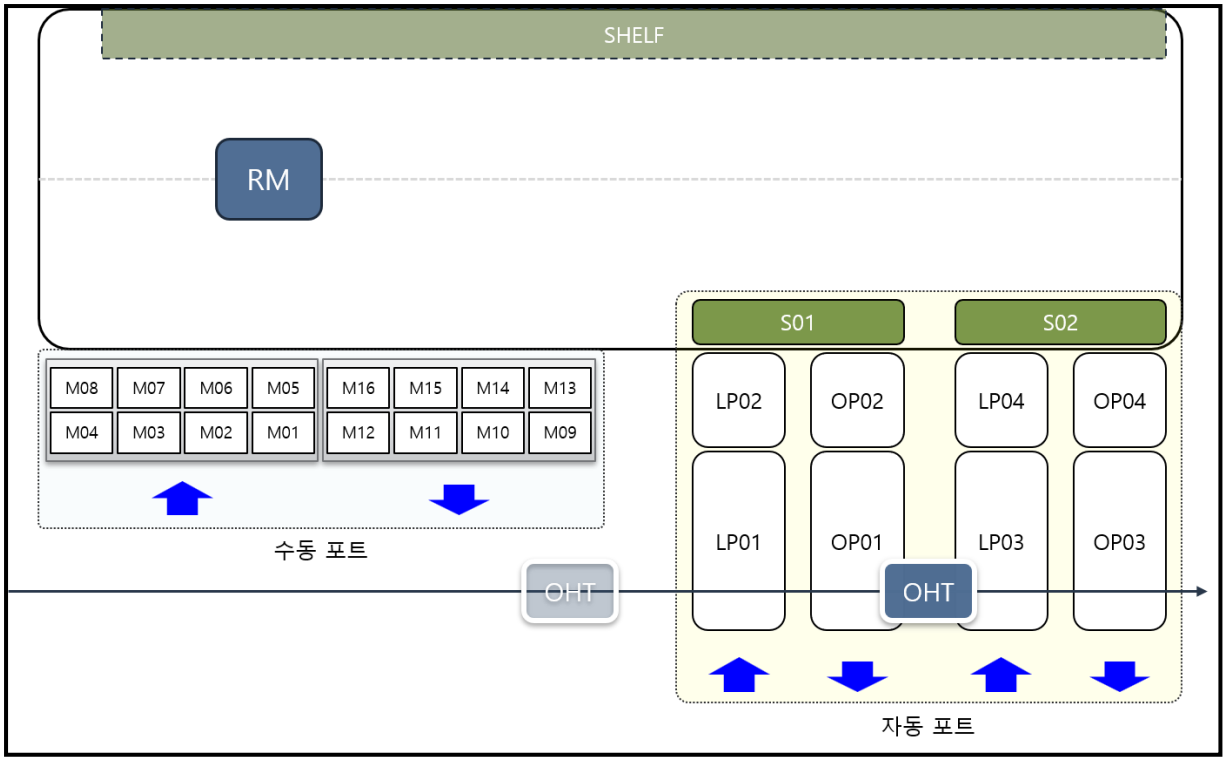
### 2.7.2. Carrier ID

| Case | Format |
|---|---|
| | Example |
| ID Read Fail | UNK_+CurrLoc(port id)+DateTime(yyyyMMddHHmmssfff) |
| | Ex) UNK_STK-K54-BM-02_LP0120160908093931123 |
| Duplicate | DUP_+CarrierID+DateTime(yyyyMMddHHmmssfff) |
| | Ex) DUP_CST00120160908093931123 |
| DoubleStore | DBS_+UnitID+DateTime(yyyyMMddHHmmssfff) |
| | Ex) DBS_ STK-K54-BM-02_204032018062216595523 |

### 2.7.3. Machine/Unit ID

| Item | Format<br>Example |
|---|---|
| STOCKERID | CtrlType-{Factory + Floor}-{Process Group}-{Stocker No} |
| | Ex) STK-K52-BM-01, STK-K52-BM-02, STK-K54-BM-01, STK-K54-BM-02 |
| UNITID | [AUTO]<br><br>In : {STOCKERID}_LP01<br>Out : {STOCKERID}_OP01 |
| | Ex) STK-K54-BM-01_LP01 , STK-K54-BM-01_OP01 |
| | [MANUAL]<br>*Manual Port is recommended to be 6 (six) or higher<br><br>In : {STOCKERID}_LP06<br>Out : {STOCKERID}_OP06 |
| | Ex) STK-K54-BM-03_LP06, STK-K54-BM-01_OP06 |
| SHELFID | {STOCKERID}_{zxxyy}<br>- Format: zxxyy (5 Digit, Bank/Bay/Level) |
| | Ex) STK-K54-BM-01_10101 ~ STK-K54-BM-01_2xxyy |
| CRANEID | {STOCKERID}_RM01 |
| | Ex) STK-K54-BM-01_RM01 |

## 2.8. Reticle Stocker Layout



# 3. SECS Messages Specification(SECS-II)

SECS-II (SEMI E5, SEMI Equipment Communications Standard Part 2) defines the structure and content of the messages exchanged between semiconductor equipment and a host computer (e.g., MES or MCS).

The actual message transport is handled by the lower-level HSMS (SEMI E37) protocol over TCP/IP.

## 3.1. Stream Function Definitions

### 3.1.1. Stream1

| Messages | Direction | Description |
|---|---|---|
| SxF0 | H<->E | Abort Transaction |
| S1F1 | H<->E | Are You There Request (R) |
| S1F2 | H<->E | On-line Data (D) |
| S1F3 | H -> E | Selected Equipment Status Request (SSR) |
| S1F4 | H <- E | Selected Equipment Status Data (SSD) |
| S1F13 | H<->E | Establish Communication Request (CR) |
| S1F14 | H<->E | Establish Communication Request Ack. (CRA) |
| S1F15 | H -> E | Request OFF-LINE(ROFL) |
| S1F16 | H <- E | OFF-LINE Ack. (OFLA) |
| S1F17 | H -> E | Request ON-LINE(RONL) |
| S1F18 | H <- E | ON-LINE Ack. (ONLA) |

### 3.1.2. Stream2

| Messages | Direction | Description |
|---|---|---|
| S2F31 | H -> E | Date and Time Set Request (DTS) |
| S2F32 | H <- E | Date and Time Set Ack. (DTA) |
| S2F41 | H -> E | Host Command Send (HCS) |
| S2F42 | H <- E | Host Command Ack. (HCA) |
| S2F49 | H -> E | Enhanced Remote Command |
| S2F50 | H <- E | Enhanced Remote Command Ack. |

### 3.1.3. Stream3

| Messages | Direction | Description |
|---|---|---|
| S3F101 | H -> E | Lot Information |
| S3F102 | H <- E | Lot Information Acknowledge |

### 3.1.4. Stream5

| Messages | Direction | Description |
|---|---|---|
| S5F1 | H <- E | Alarm Report send (ARS) |
| S5F2 | H -> E | Alarm Report Acknowledge (ARA) |
| S5F3 | H -> E | Alarm Valid/Invalid Setting |
| S5F4 | H <- E | Alarm Valid/Invalid Setting Acknowledge |
| S5F5 | H -> E | Alarm List Request |
| S5F6 | H <- E | Alarm List Request Acknowledge |

### 3.1.5. Stream6

| Messages | Direction | Description |
|---|---|---|
| S6F11 | H <- E | Event Report Send(ERS) |
| S6F12 | H -> E | Event Report Acknowledge(ERA) |

### 3.1.6. Stream9

| Messages | Direction | Description |
|---|---|---|
| S9F1 | H <- E | Unrecognized Device ID |
| S9F3 | H <- E | Unrecognized Stream Type |
| S9F5 | H <- E | Unrecognized Function Type |
| S9F7 | H <- E | Illegal Data |
| S9F9 | H <- E | Transaction Timer Timeout |

### 3.1.7. Stream10

| Messages | Direction | Description |
|---|---|---|
| S10F3 | H -> E | Terminal Display |
| S10F4 | H <- E | Terminal Display Ack. |

## 3.2. Event Report Definition

### 3.2.1. Controller State Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 1101 | OFFLINE | LOCAL, REMOTE | OFFLINE |
| 1102 | LOCAL | OFFLINE, REMOTE | LOCAL |
| 1103 | REMOTE | OFFLINE, LOCAL | REMOTE |

### 3.2.2. SC State Transition Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 1201 | SC Auto Initiated | None | SC Init |
| 1202 | SC Auto Complete | Paused, Pausing | Auto |
| 1203 | SC Pause Initiated | Auto | Pausing |
| 1204 | SC Pause Completed | Pausing | Paused |
| 1205 | SC Paused | SC Init | Paused |
| 1303 | Unit Alarm Set | No Alarms | Alarms |
| 1304 | Unit Alarm Clear | Alarms | No Alarms |

### 3.2.3. Transfer Command Transition Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 3101 | Transfer Initiated | QUEUED | TRANSFERRING |
| 3102 | Transfer Completed | ACTIVE | NONE |
| 3103 | Transfer Paused | TRANSFERRING | PAUSED |
| 3104 | Transfer Resumed | PAUSED | TRANSFERRING |
| 3201 | Transfer Abort Initiated | ACTIVE | ABORTING |
| 3202 | Transfer Abort Completed | ABORTING | NONE |
| 3203 | Transfer Abort Failed | ABORTING | ACTIVE |
| 3301 | Transfer Cancel Initiated | QUEUED | CANCELLING |
| 3302 | Transfer Cancel Completed | CANCELLING | NONE |
| 3303 | Transfer Cancel Failed | CANCELLING | QUEUED |

### 3.2.4. Crane State Transition Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 4101 | Crane Active | IDLE | ACTIVE |
| 4102 | Crane Idle | ACTIVE | IDLE |

### 3.2.5. Carrier State Transition Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 2101 | Carrier ID read | NONE | NONE |
| 2102 | Carrier wait in | NONE | WAITIN |
| 2103 | Carrier transferring | WAITIN | TRANSFERRING |
| 2104 | Carrier stored | TRANSFERRING | COMPLETE |
| 2105 | Carrier stored alt | TRANSFERRING | ALTERNATE |
| 2106 | Carrier wait out | TRANSFERRING | WAITOUT |
| 2107 | Carrier removed | WAITOUT | NONE |
| 2108 | Carrier mapping info | NONE | NONE |
| 2201 | Carrier install comp. | NONE | INSTALL |
| 2202 | Carrier remove comp. | INSTALL | NONE |

### 3.2.6. Operator Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 4301 | Operator Init Action | | |

### 3.2.7. Zone Status Transition Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 4201 | Zone Capacity Change | | |

### 3.2.8. State Event

| CEID | NAME | STATE | |
|---|---|---|---|
| | | OLD | NEW |
| 5101 | Unit State Changed | Inservice<br>Out of Service | Out of Service<br>Inservice |
| 5102 | Unit Status Changed | Empty<br>Occupied | Occupied<br>Empty |

## 3.3. Variable Data Items

### 3.3.1. Basic VID

| VID | Name | Class | Format | Details |
|---|---|---|---|---|
| 1 | SC Name | SV/DV | A,64 | SC ID<br>Eqp Name |
| 2 | Control State | SV/DV | U2,1 | 1: Eqp Offline<br>2: Attempt Online<br>3: Host Offline<br>4: Online Local<br>5: Online Remote |
| 3 | SC State | SV/DV | U2,1 | 1=SC Init<br>2=Paused<br>3=Auto<br>4=Pausing |
| 4 | Active Carriers | SV | L,n<br>1. <CarrierInfo1><br>…<br>n. <CarrierInfon> | |
| 5 | Active Transfers | SV | L,n<br>1. <TransferCommand1><br>…<br>n. <TransferCommandn> | |
| 6 | Active Zones | SV | L,n<br>1. <ZoneInfo1><br>…<br>n. <ZoneInfon> | |
| 7 | All Unit Infos | SV | L,n<br>1. <Unit Info><br>…<br>n. <Unit Info> | |
| 8 | All Shelf Infos | SV | L,n<br>1. <Shelf Info><br>…<br>n. <Shelf Info> | |
| 9 | Active Unit Alarms | SV | L,n<br>1. <UnitAlarmInfo><br>…<br>n. <UnitAlarmInfo> | |

| VID | Name | Class | Format | Details |
|---|---|---|---|---|
| 10 | CarrierInfo | SV/DV | L,2<br><A,64 CarrierID><br><A,64 CarrierLoc> | |
| 11 | TransferCommand | SV/DV | L,3<br><CommandInfo><br><TransferInfo><br>< SubCarrierIDList > | |
| 12 | CommandInfo | SV/DV | L,2<br><A,64 CommandID><br><U2,1 Priority> | Priority 1~99 |
| 13 | TransferInfo | SV/DV | L,4<br><A,64 CarrierID><br><A,64 CarrierLoc><br><A,64 Source><br><A,64 Dest> | |
| 14 | SubCarrierIDList | SV/DV | L, n<br><A,64 SubCarrierID> | |
| 15 | ZoneInfo | SV/DV | L,3<br><A,64 Zone Name><br><U2,1 Zone Capacity><br><U2,1 Max Capacity> | |
| 16 | UnitInfo | SV/DV | L,3<br><A,64 Unit ID><br><U2,1 Unit State><br><U2,1 Unit Status> | Port or Crane(RM) |
| 17 | Shelf Info | SV | L,4<br><A,64 Shelf Unit ID><br><A,64 Zone Name><br><U2,1 Shelf Unit State><br><A,64 Carrier ID> | |
| 18 | Unit Alarm Info | SV/DV | L3<br><A,64 UnitID><br><U2,1 Alarm ID><br><A, 128 Alarm Text> | |

### 3.3.2. Transfer & Device VID

| VID | Name | Class | Format | Details |
|---|---|---|---|---|
| 101 | CommandID | DV | A,64 | |
| 102 | CarrierID | DV | A,64 | CarrierID or ReticleID |
| 103 | UnitID | DV | A,64 | * CraneID, PortID, ShelfID |
| 104 | Unit State | SV/DV | U2 | 1: OutofService<br>2: Inservice |
| 105 | Unit Status | SV/DV | U2 | 1: Empty<br>2: Occupied(Full) |
| 106 | ZoneName | DV | A,64 | |
| 107 | ZoneCapacity | DV | U2 | Available Capacity |
| 108 | MaxCapacity | SV | U2 | Total Capacity |
| 109 | AlarmID | SV | U2 | |
| 110 | AlarmText | SV/DV | A,64 | |
| 111 | ErrorID | DV | A,64 | |
| 112 | Source | DV | A,64 | |
| 113 | Dest | DV | A,64 | |
| 114 | CarrierLoc | DV | A, 64 | |
| 115 | SubCarrierID | DV | A,64 | ReticleID |
| 116 | HandoffType | DV | U2 | 1: Manual<br>2: Automated |
| 117 | IDRead Status | DV | U2 | 0: OK<br>1: Fail<br>2: Duplicate<br>3: Mismatch |

| VID | Name | Class | Format | Details |
|---|---|---|---|---|
| 118 | Recovery Option | DV | A,64 | blank<br>RETRY<br>ABORT |
| 119 | ResultCode | DV | U2,1 | 0: Success, Nonzero: Error |
| 120 | FOUPID | DV | A, 64 | |
| 121 | CommandType | DV | A, 20 | Transfer type used for operator-initiated actions.<br>-TRANSFER<br>-CANCEL<br>-ABORT |

## 3.4. Remote Command Definitions

### 3.4.1. Remote Command Name(S2F41, F49)

| RCMD | CPNAME | COMMENT |
|---|---|---|
| ABORT | “COMMANDID” | Requests termination of a specific active transfer command identified by COMMANDID. Execution depends on the equipment's current state. |
| CANCEL | “COMMANDID” | Requests cancellation of a specific queued transfer command identified by COMMANDID. Can be executed regardless of the equipment's state. |
| PAUSE | NONE | Requests the equipment to switch to Pause mode |
| RESUME | NONE | Requests the equipment to switch back to Auto mode from Pause. |
| TRANSFER | “COMMANDINFO”<br>“TRANSFERINFO”<br>“SUBCARRIERLIST” | Typically used instead of S2F41; requests the transfer of a carrier from a specific source to a designated destination. |
| REMOVE | “CARRIERID” | Delete the corresponding carrier information from the SC database. |
| INSTALL | “CARRIERID”<br>“CARRIERLOC”<br>“LOTID” | Insert specific carrier information into the SC database. |

### 3.4.2. Remote Command Parameters

| CPNAME | Format | COMMENT |
|---|---|---|
| COMMANDID | A,64 | Unique identifier of commands generated by the MCS |
| PRIORITY | U2 | Execution priority of Remote Command Low 1 ~ 99 High |
| CARRIERID | A,64 | Unique Carrier Id |
| CARRIERLOC | A,64 | Unique Carrier Location Within The Stocker |
| LOTID | A,64 | Lot ID (used by INSTALL, optional) |
| SOURCE | A,64 | Unique Source Location |
| DEST | A,64 | Destination Location |
| COMMANDINFO | <L, 2<br><COMMANDID<br><PRIORITY | Command ID and priority pair |
| TRANSFERINFO | <L, 3<br><CARRIERID<br><SOURCE<br><DEST | Carrier ID, source and destination of the transfer |
| SUBCARRIERLIST | <L, n<br><SUBCARRIERINFO><br><SUBCARRIERINFO> | List of subcarriers in the carrier. Empty carrier (FOUP): <L,0> |
| SUBCARRIERINFO | <L, 2<br><SUBCARRIERID><br><SUBCARRIERLOC> | One subcarrier entry (ID + location in carrier) |
| SUBCARRIERID | A,64 | Subcarrier ID (Reticle ID) |
| SUBCARRIERLOC | A,64 | Subcarrier Location |

## 3.5. Stream Function Details

### 3.5.1. S1F1-Are you there

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 1 | Establish if the equipment is on line | True | H<->E |
| HEADER ONLY. | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 2 | Data signifying that the equipment is alive | False | H<-E |
| < L, 2<br>< A[64] MDLN> * Model Number of the equipment<br>< A[64] SOFTREV> * Software Revision | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 2 | Data signifying that the host is alive | False | H->E |
| < L, 0 | | | | |

### 3.5.2. S1F3-Selected Equipment Status Request

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 3 | HOST QUERY AMHS SC INFO | True | H->E |

<L,8
<U2,1 2> /*control state */
<U2,1 3> /*SC state */
<U2,1 4> /Active Carriers
<U2,1 5> /Active Transfers
<U2,1 6> /Active Zones
<U2,1 7> /All Unit info
<U2,1 8> /All Shelf info
<U2,1 9> / All Unit alarms

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 4 | HOST QUERY AMHS SC INFO REPLY | False | H<-E |

```
<L,8
        <U2,1 Control state
        <U2,1 SC state
        <L n Carrier info
                <L 2
                        <A,64 CarrierID
                        <A,64 Carrier Loc
        <L,n
                <L,3  TransferCommand
                        <L,2 Command info
                                <A,64 CommandID
                                <U2,1 Priority
                        <L,4 Transfer Info
                                <A,64 CarrierID
                                <A,64 CarrierLoc
                                <A,64 Source
                                <A,64 Dest
                        <L,n SubCarrier info (example: n=2)
                                <A,64 SubCarrierID1
                                <A,64 SubCarrierID2
        <L,n  Zone info
                <L,3
                        <A,64 Zone Name
                        <U2,1 Zone Capacity * Available Capacity
                        <U2,1 Zone MaxCapacity
        <L,n  Unit info
                <L,3
                        <A,64 Unit ID
                        <U2,1 Unit state
                        <U2,1 Unit status
        <L,n  Shelf info
                <L,4
                        <A,64 Unit ID (Shelf ID)
                        <A,64 Zone Name
                        <U2,1 Unit State (Shelf State)
                        <A,64 Carrier ID
        <L,n Active Unit Alarms
                <L,3
                        <A,64  Unit ID
                        <U2,1  Alarm ID
                        <A,128 Alarm text
```

### 3.5.3. S1F13-Establish Communication Request

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 13 | Initialize communications at a logical application level both on power-up and following a break in communications. | True | H<->E |

**E->H**

```
<L 2
   <A[64] MDLN>
   <A[64] SOFTREV>
```

**H->E**

```
<L 0
```

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 14 | Accept or deny Establish Communication Request | False | H<->E |

**E->H**

```
<L, 2
   <B[1] COMMACK>
   <L, 2
      <A[64] MDLN>
      <A[64] SOFTREV>
```

**H->E**

```
<L, 2
   <B[1] COMMACK>
      <L 0
```

### 3.5.4. S1F15-Offline Request

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 15 | The Host requests that the equipment transition to the OFF-LINE state. | True | H->E |
| Header Only | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 16 | Acknowledge or Error. | False | H<-E |
| <B[1] OFLACK | | | | |

### 3.5.5. S1F17-Online Request

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 17 | The Host requests that the equipment transition to the ON-LINE state. | True | H->E |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 1 | 18 | Acknowledge or Error. | False | H<-E |
| <B[1] ONLACK<br><br>0: OK<br>1: Not-Allowed<br>2: Already online | | | | |

### 3.5.6. S2F31-Date and Time Request

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 31 | Useful to synchronize the equipment time with the host time base. | True | H->E |
| <A[16] TIME | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 32 | Acknowledge the receipt of time and date. | False | H<-E |
| <B[1] TIACK | | | | |

### 3.5.7. S2F41-Host Command Send(REMOVE)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 41 | SC DB Delete by carrier id | True | H->E |

```
< L, 2
   < A[64] RCMD > * REMOVE
   < L ,1
      <L, 2
         <A,64 CPNAME > * CARRIERID
         <A,64 CPVAL > * CarrierID
```

### 3.5.8. S2F41-Host Command Send(INSTALL)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 41 | SC DB Update By Carrier Id | True | H->E |

```
< L, 2
   < A[64] RCMD > * INSTALL
   < L, 3
      <L, 2
         <A,64 CPNAME > * CARRIERID
         <A,64 CPVAL > * CarrierID
      <L, 2
         <A,64 CPNAME > * CARRIERLOC
         <A,64 CPVAL > * Carrier Current Location
      <L, 2
         <A,64 CPNAME > * LOTID
         <A,64 CPVAL > * LOTID value
```

### 3.5.9. S2F41-Host Command Send(CANCEL)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 41 | The Host Requests the Equipment perform the specified remote command with the associated parameters. | True | H->E |

```
< L, 2
   < A[64] RCMD > * CANCEL
   < L ,1
      <L, 2
         <A,64 CPNAME > * COMMANDID
         <A,64 CPVAL >  * CommandId
```

### 3.5.10. S2F41-Host Command Send(ABORT)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 41 | The Host Requests the Equipment perform the specified remote command with the associated parameters. | True | H->E |

```
< L, 2
   < A[64] RCMD > * ABORT
   < L, 1
      <L, 2
         <A[64] CPNAME > * COMMANDID
         <A[64] CPVAL >  * CommandId
```

### 3.5.11. S2F41-Host Command Send(PAUSE)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 41 | The Host Requests the Equipment perform the specified remote command with the associated parameters. | True | H->E |

< L, 2
  < A[64] RCMD > * PAUSE
  < L, 0

### 3.5.12. S2F41-Host Command Send (RESUME)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 41 | The Host Requests the Equipment perform the specified remote command with the associated parameters. | True | H->E |

< L, 2
  < A[64] RCMD > * RESUME
  < L, 0

### 3.5.13. S2F42-Host Command Acknowledge

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 42 | Acknowledge Host command or error. If command is not accepted due to one or more invalid parameters. | False | H<-E |

**No Error**
< L, 2
< B[1] HCACK > 0
< L, 0
**Some Error**
< L, 2
< B[1] HCACK > 3
< L, n
<L, 2
<A[64] CPNAME > Command Parameter Name
<B[1] CPACK > Control Parameter Ack Code
...
<L, 2
<A[64] CPNAME > Command Parameter Name
<B[1] CPACK > Control Parameter Ack Code

➢ Request HCACK= 5 for the same command

- 0 : Acknowledge, command has been performed
- 1 : Command does not exist
- 2 : Cannot perform now
- 3 : At least one parameter is invalid
- 4 : Acknowledge, command will be performed with completion signaled later by an event
- 5 : Rejected, Already in Desired Condition
- 6 : No such object exist
- 7 – 63 : Reserved

### 3.5.14. S2F49-Transfer

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 49 | The Host requests the equipment perform the specified enhanced remote command (TRANSFER) with the associated parameters | True | H->E |

```
< L, 4
      < U2 DATAID>
      < A[64] OBJSPEC>
      < A[64] RCMD> * TRANSFER
      < L, 3
          <L, 2
              <A,64 CPNAME > * COMMANDINFO
              <L, 2
                  <L, 2
                      <A,64 CPNAME > * COMMANDID
                      <A,64 CEPVAL >  * CommandID
                  <L, 2
                      <A,64 CPNAME > * PRIORITY
                      <U2[1] CEPVAL > * Priority
          <L, 2
              <A,64 CPNAME > * TRANSFERINFO
              <L, 3
                  <L, 2
                      <A,64 CPNAME > * CARRIERID
                      <A,64 CEPVAL >  * CarrierID
                  <L, 2
                      <A,64 CPNAME > * SOURCE * ZONENAME, PORTID
                      <A,64 CEPVAL >  * Source
                  <L, 2
                      <A,64 CPNAME > * DEST * ZONENAME, PORTID
                      <A,64 CEPVAL >  * Destination
          <L, 2
              <A,64 CPNAME > * SUBCARRIERLIST
              <L, n    * n = number of subcarriers in the carrier (this example: n=3)
                  <L, 2
                      <L, 2
                          <A,64 CPNAME > * SUBCARRIERID
                          <A,64 CEPVAL >  * SubCarrierID1
                      <L, 2
                          <A,64 CPNAME > * SUBCARRIERLOC
                          <A,64 CEPVAL >  * SubCarrierLoc
                  <L, 2
                      <L, 2
                          <A,64 CPNAME > * SUBCARRIERID
                          <A,64 CEPVAL >  * SubCarrierID2
                      <L, 2
                          <A,64 CPNAME > * SUBCARRIERLOC
                          <A,64 CEPVAL >  * SubCarrierLoc
                  <L, 2
                      <L, 2
                          <A,64 CPNAME > * SUBCARRIERID
                          <A,64 CEPVAL >  * SubCarrierID3
                      <L, 2
                          <A,64 CPNAME > * SUBCARRIERLOC
                          <A,64 CEPVAL >  * SubCarrierLoc
```

### 3.5.15. S2F50-Enhanced Remote Command Acknowledge

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 2 | 50 | The equipment acknowledge Enhanced Remote Command or reports any error(s). If the command is not accepted due to one or more invalid parameters, (i.e. HCACK=3), then a list of invalid parameters will be returned containing the parameter name and reason for being invalid. | False | H<-E |

**No Error**
< L, 2
< B[1] HCACK > 0
< L ,0
**Some Error**
< L, 2
< B[1] HCACK > 3
< L, 2
<L, 2
<A[64] CPNAME > Command Parameter Name
<B[1] CEPACK > Control Parameter Ack Code
.....
<L, 2
<A[64] CPNAME > Command Parameter Name
<B[1] CEPACK > Control Parameter Ack Code

- Request HCACK= 5 for the same command
- 0 : Acknowledge, command has been performed
- 1 : Command does not exist
- 2 : Cannot perform now
- 3 : At least one parameter is invalid
- 4 : Acknowledge, command will be performed with completion signaled later by an event
- 5 : Rejected, Already in Desired Condition
- 6 : No such object exist
- 7 – 63 : Reserved

### 3.5.16. S3F101-LOT INFO SEND

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 3 | 101 | Lot Info Send | True | H->E |

```
<L, 10
        <L, 2
                <A,64 $VNAME > * CUSTOMER
                <A,64 $VVAL >  * Customer value
        <L, 2
                <A,64 $VNAME > * STRIPMARKING
                <A,64 $VVAL >  * Strip marking
        <L, 2
                <A,64 $VNAME > * LOTNUMBER
                <A,64 $VVAL >  * Lot Number value
        <L, 2
                <A,64 $VNAME > * CARRIERID
                <A,64 $VVAL >  * CarrierID
        <L, 2
                <A,64 $VNAME > * LOTID
                <A,64 $VVAL >  * LOTID
        <L, 2
                <A,64 $VNAME > * SUBID
                <A,64 $VVAL >  * SUBID
        <L, 2
                <A,64 $VNAME > * LOTTYPE
                <A,64 $VVAL >  * LOTTYPE
        <L, 2
                <A,64 $VNAME > * DCC
                <A,64 $VVAL >  * DCC
        <L, 2
                <A,64 $VNAME > * OP
                <A,64 $VVAL >  * OP
        <L, 2
                <A,64 $VNAME > * CustName
                <A,64 $VVAL >  * CustName
```

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 3 | 102 | Lot Info Send Ack | False | H<-E |
| < B [1] LIACK> | | | | |

### 3.5.17. S5F1-Alarm Report

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 5 | 1 | This message reports a change in or presence of an alarm condition. | True | H<-E |

< L, 3
  < B [1] ALCD>  * Alarm Code
  < U2 [1] ALID>  * Alarm Id
  < A[128] ALTX>  * Alarm Text

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 5 | 2 | Acknowledge or error. | False | H->E |

< B [1] ACKC5>

### 3.5.18. S5F3-Alarm Valid/Invalid Setting

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 5 | 3 | Valid/Invalid Alarms | True | H->E |

< L, 2
  < B [1] ALED>  * Alarm Valid/Invalid Code
  < U2 [1] ALID>  * Alarm Id

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 5 | 4 | Acknowledge to Alarm Valid/Invalid Setting | False | H->E |

< B [1] ACKC5>

### 3.5.19. S5F5-Alarm List

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 5 | 5 | This message reports a change in or presence of an alarm condition. | True | H<-E |

< L, n
  < U2 [1] ALID>  * Requested Alarm Id
  .....
  < U2 [1] ALID>  * Requested Alarm Id

**Or**

<L, 0 : All Alarm Request

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 5 | 6 | Acknowledge to Alarm List Request | False | H->E |

<L, n
  < L, 3
    < B [1] ALCD>  * Alarm Code
    < U2 [1] ALID>  * Alarm Id
    < A[128] ALTX>  * Alarm Text
  .....
  < L, 3
    < B [1] ALCD>  * Alarm Code
    < U2 [1] ALID>  * Alarm Id
    < A[128] ALTX>  * Alarm Text

### 3.5.20. S6F11-Event Report Send (RPTID 1)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 3
                                <A,64 EqpName>
                                <U2,1 Control state>
                                <U2,1 SC state>
```

| CEID | Event Name |
|---|---|
| 1101 | OFFLINE |
| 1102 | LOCAL |
| 1103 | REMOTE |
| 1201 | Auto Init |
| 1202 | Auto Complete |
| 1203 | Pause Init |
| 1204 | Pause Complete |
| 1205 | Paused |

### 3.5.21. S6F11-Event Report Send (RPTID 2)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 2
                                <L,2
                                        <A,64 CarrierID>
                                        <A,64 Carrier Loc>
                                <U2[1] IDReadStatus>
```

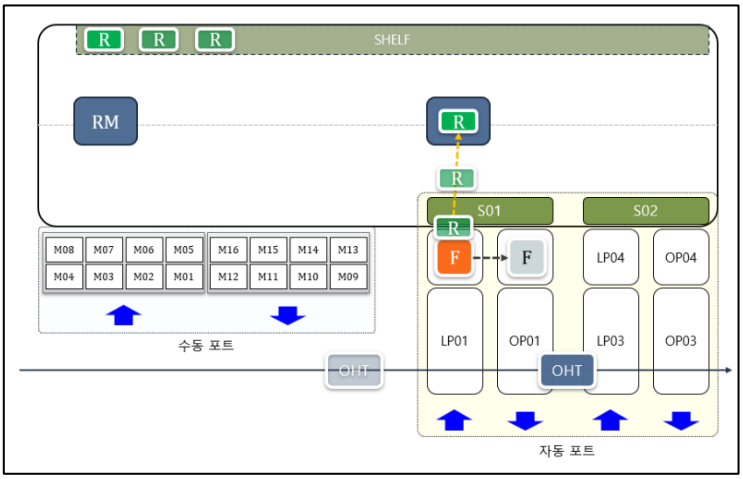
| CEID | Event Name |
|---|---|
| 2101 | Carrier ID Read |

### 3.5.22. S6F11-Event Report Send (RPTID 3)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

< L, 3
< U2 [1] DATAID>
< U2 [1] CEID>
<L, 1
< L, 2
<U2 [1] RPTID>
<L, 2
<L,2
<A,64 CarrierID>
<A,64 Carrier Loc>
<A,64 FOUPID>

| CEID | Event Name |
|---|---|
| 2102 | Carrier Wait in |




< L, 3
< U2 [1] DATAID 0>
< U2 [1] CEID 2102>
<L, 1
< L, 2
<U2 [1] RPTID>
<L, 2
<L,2
**<A,64 CarrierID "R">**
<A,64 Carrier Loc "RM01">
**<A,64 FOUPID "F">**

### 3.5.23. S6F11-Event Report Send (RPTID 4)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 1
                                <L,2
                                        <A,64 CarrierID>
                                        <A,64 Carrier Loc>
```

| CEID | Event Name |
|---|---|
| 2103 | Carrier Transferring |
| 2104 | Carrier Stored |
| 2105 | Carrier Stored Alt |
| 2106 | Carrier Wait Out |
| 2201 | Carrier Install Comp. |
| 2202 | Carrier Remove Comp. |

### 3.5.24. S6F11-Event Report Send (RPTID 5)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 2
                                <L,2
                                        <A,64 CarrierID>
                                        <A,64 Carrier Loc>
                                <U2[1] HandoffType>
```

| CEID | Event Name |
|---|---|
| 2107 | Carrier removed |

### 3.5.25. S6F11-Event Report Send (RPTID 6)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 3
                                <L,2
                                        <A,64 CommandID>
                                        <U2,1 Priority>
                                <L,4
                                        <A,64 CarrierID>
                                        <A,64 CarrierLoc>
                                        <A,64 Source>
                                        <A,64 Dest>
                                <L,n (* Includes Reticle Count)
                                        <A,64 SubCarrierID1>
                                        <A,64 SubCarrierIDn>
```

| CEID | Event Name |
|---|---|
| 3101 | Transfer Initiated |
| 3103 | Transfer Paused |
| 3104 | Transfer Resumed |
| 3201 | Transfer Abort Initiated |
| 3202 | Transfer Abort Completed |
| 3203 | Transfer Abort Failed |
| 3301 | Transfer Cancel Initiated |
| 3302 | Transfer Cancel Completed |
| 3303 | Transfer Cancel Failed |

### 3.5.26. S6F11-Event Report Send (RPTID 7)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L,4
                                <L,2
                                        <A,64 CommandID>
                                        <U2,1 Priority>
                                <L,4
                                        <A,64 CarrierID>
                                        <A,64 CarrierLoc>
                                        <A,64 Source>
                                        <A,64 Dest>
                                <L,n (* Includes Reticle Count)
                                        <A,64 SubCarrierID1>
                                        <A,64 SubCarrierIDn>
                                <U2,1 ResultCode>
```

| CEID | Event Name |
|---|---|
| 3102 | Transfer complete |

### 3.5.27. S6F11-Event Report Send (RPTID 8)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L,4
                                <L,2
                                        <A,64 CommandID>
                                        <U2,1 Priority>
                                <L,4
                                        <A,64 CarrierID>
                                        <A,64 CarrierLoc>
                                        <A,64 Source>
                                        <A,64 Dest>
                                <L,n (* Includes Reticle Count)
                                        <A,64 SubCarrierID1>
                                        <A,64 SubCarrierIDn>
                                <A,20 CommandType>
```

| CEID | Event Name |
|---|---|
| 4301 | Operator Init Action |

### 3.5.28. S6F11-Event Report Send (RPTID 9)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 2
                                <L, 2
                                        <A,64 CommandID>
                                        <U2,1 Priority>
                                <A,64 UnitID>
```

| CEID | Event Name |
|---|---|
| 4101 | ACTIVE |
| 4102 | IDLE |

### 3.5.29. S6F11-Event Report Send (RPTID 10)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 2
                                <A,64 UnitID>   * Shelf, Port, Crane
                                <U2[1] Unit State>
```

| CEID | Event Name |
|---|---|
| 5101 | Unit State Changed (1: OutofService, 2: Inservice) |

### 3.5.30. S6F11-Event Report Send (RPTID 11)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 2
                                <A,64 UnitID>   * Shelf, Port, Crane
                                <U2[1] Unit Status>
```

| CEID | Event Name |
|---|---|
| 5102 | Unit status changed (1: Empty, 2: Occupied) |

### 3.5.31. S6F11-Event Report Send (RPTID 12)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L,1
                                <L, 3
                                        <A,64 Zone Name>
                                        <U2,1 Zone Capacity>   * Available Capacity
                                        <U2,1 Max Capacity>
```

| CEID | Event Name |
|---|---|
| 4201 | Zone Capacity Change |

### 3.5.32. S6F11- Event Report Send (RPTID 13)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                <L, 2
                        <U2 [1] RPTID>
                        <L, 1
                                <L, 3
                                        <A,64  Unit ID>
                                        <U2,1  AlarmID>
                                        <A,128 AlarmText>
```

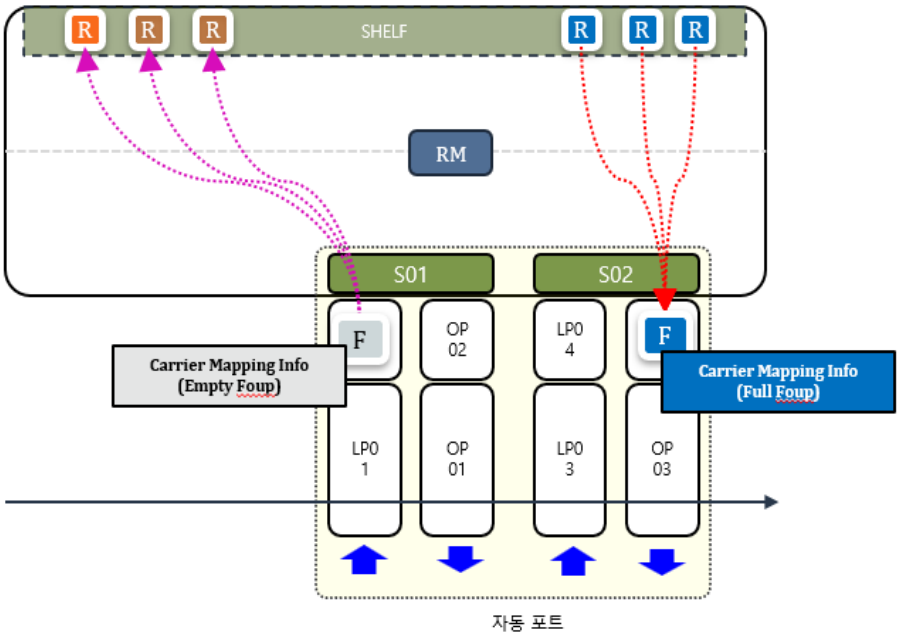
| CEID | Event Name |
|---|---|
| 1303 | Unit Alarm Set |
| 1304 | Unit Alarm Clear |

### 3.5.33. S6F11- Event Report Send (RPTID 14)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 11 | The equipment send event | True | H<-E |

```
< L, 3
        < U2 [1] DATAID>
        < U2 [1] CEID>
        <L, 1
                < L, 2
                        <U2 [1] RPTID>
                        <L, 3
                                <A,64  CommandID>
                                <L, 2
                                        <A,64  CarrierID>
                                        <A,64  CarrierLoc>
                                <L, n (* SubCarriers)
                                        <A,64  SubCarrierID>
```

| CEID | Event Name |
|---|---|
| 2108 | Carrier Mapping Info |




| Empty FOUP | Full FOUP (Includes Reticle) |
|---|---|
| < L, 3<br>< U2 [1] DATAID><br>< U2 [1] CEID 2108 ><br><L, 1<br>< L, 2<br><U2 [1] RPTID><br><L, 3<br><A,64 CommandID **“”**><br><L, 2<br><A,64 CarrierID **“FOUP1”**><br><A,64 CarrierLoc “**LP02**”><br><L, 0 *SubCarrierIDList | < L, 3<br>< U2 [1] DATAID><br>< U2 [1] CEID 2108><br><L, 1<br>< L, 2<br><U2 [1] RPTID><br><L, 3<br><A,64 CommandID **“HCMD123”**><br><L, 2<br><A,64 CarrierID **“FOUP1”**><br><A,64 CarrierLoc “**OP04**”><br><L, 4 (* SubCarrierIDList)<br><A,64 SubCarrierID **“RET1”**><br><A,64 SubCarrierID **“RET2”**><br><A,64 SubCarrierID **“RET3”**><br><A,64 SubCarrierID **“RET4”**> |

### 3.5.34. S6F12-Event Report Acknowledge

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 6 | 12 | Acknowledge or error. | False | H->E |
| <B1 ACKC6>. | | | | |

### 3.5.35. 9F1/3/5/7/9-Transaction Error

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 9 | 1 | Unrecognized Device ID | True | H<-E |
| < MHEAD B[10]> | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 9 | 3 | Unrecognized Stream Type | True | H<-E |
| < MHEAD B[10]> | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 9 | 5 | Unrecognized Function Type | True | H<-E |
| < MHEAD B[10]> | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 9 | 7 | Illegal Data | True | H<-E |
| < MHEAD B[10]> | | | | |

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 9 | 9 | Transaction Timer Timeout | True | H<-E |
| < SHEAD B[10]> | | | | |

### 3.5.36. S10F3-Terminal Display (Single)

| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 10 | 3 | Terminal Display, Single | True | H<-E |
| < L, 2<br>< B [1] TID> * Terminal Id<br>< A[1024] TEXT> * Terminal Text | | | | |

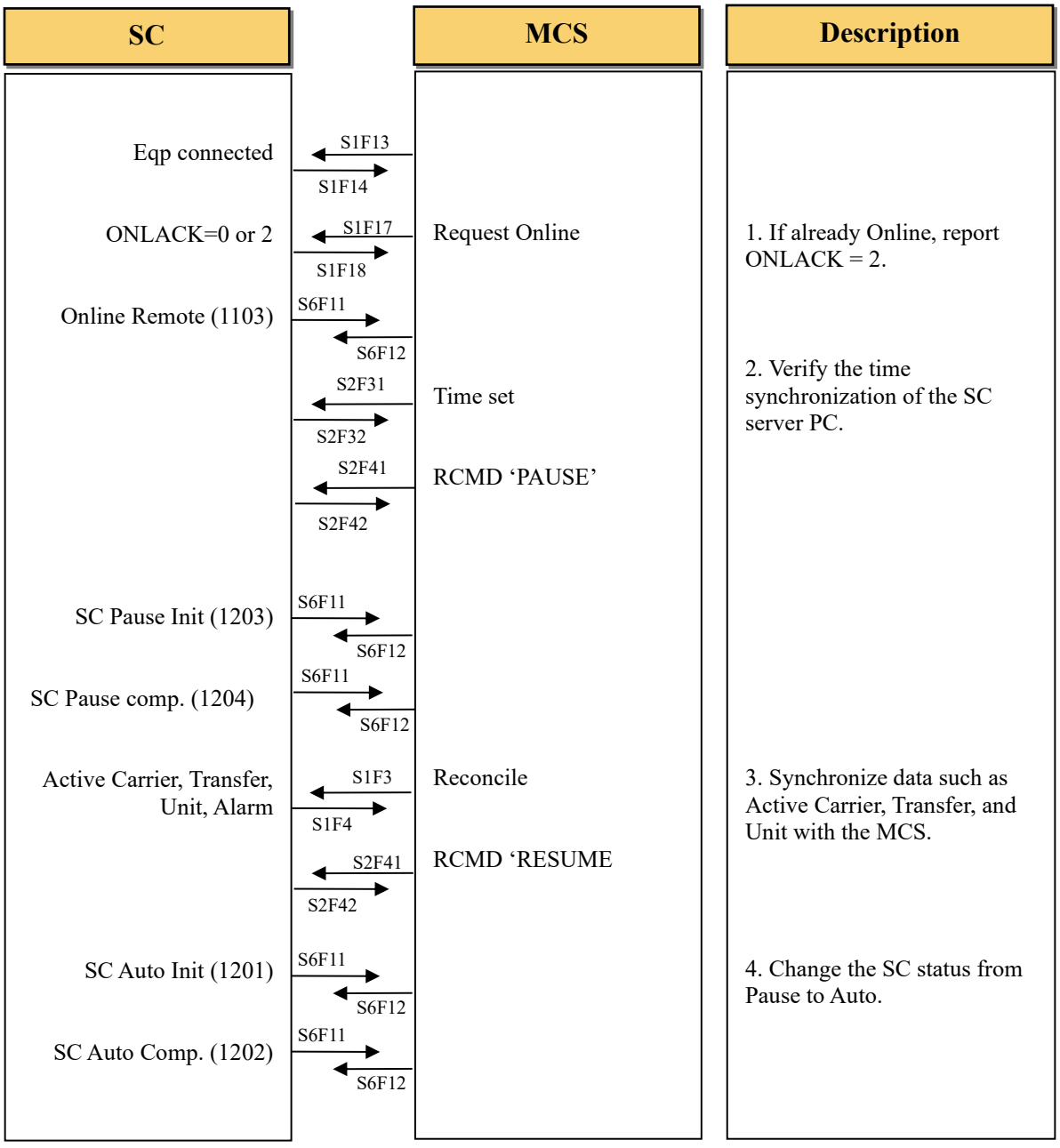
| Stream | Function | Description | Wait bit | Direction |
|---|---|---|---|---|
| 10 | 4 | Acknowledge or error. | False | H->E |
| < B [1] ACKC10> | | | | |

# 4. Scenario

## 4.1. Initialize

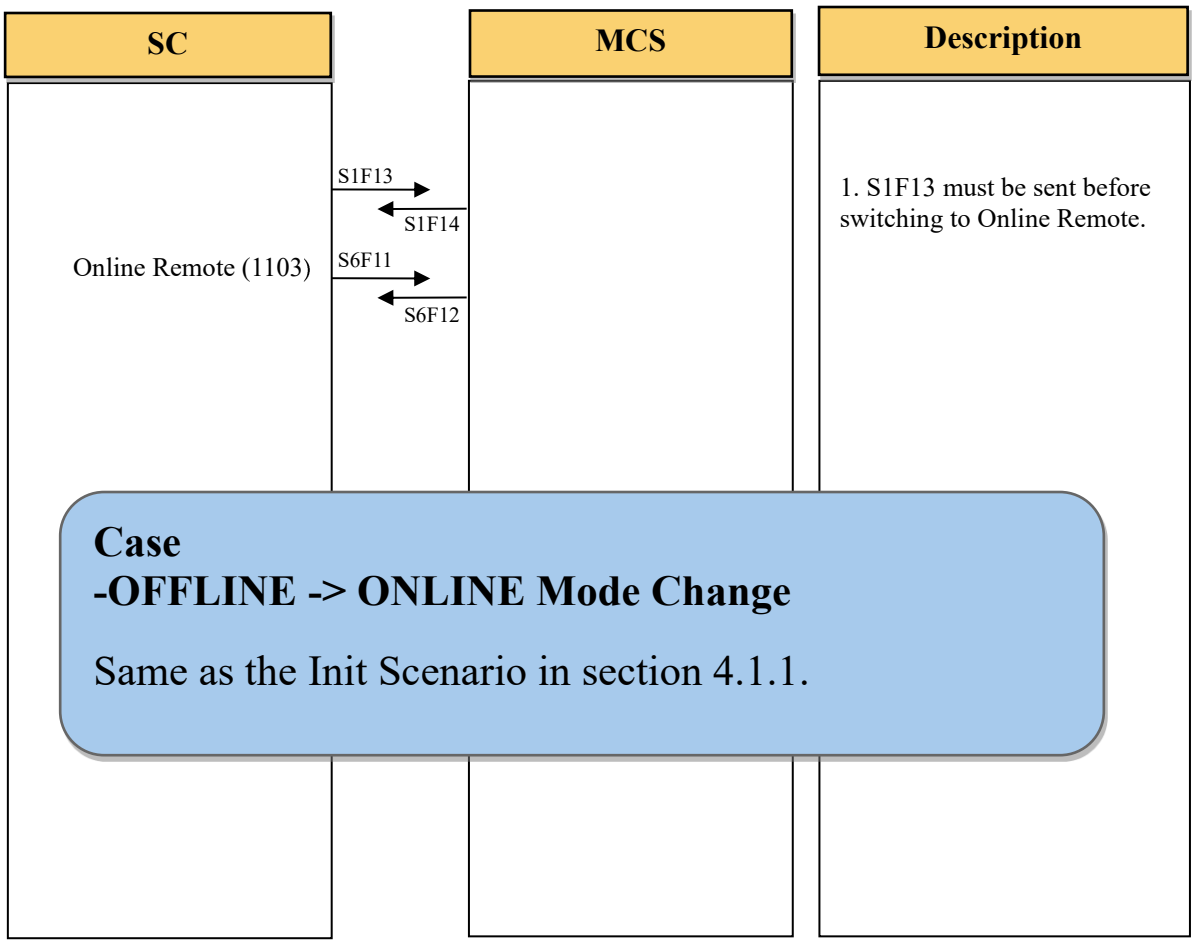
### 4.1.1. Initialize On Connect

It describes the process in which the SC transitions from the Offline state to the Online Remote mode when the communication is first established (on connect)



### 4.1.2. Initialize By SC Offline -> Remote

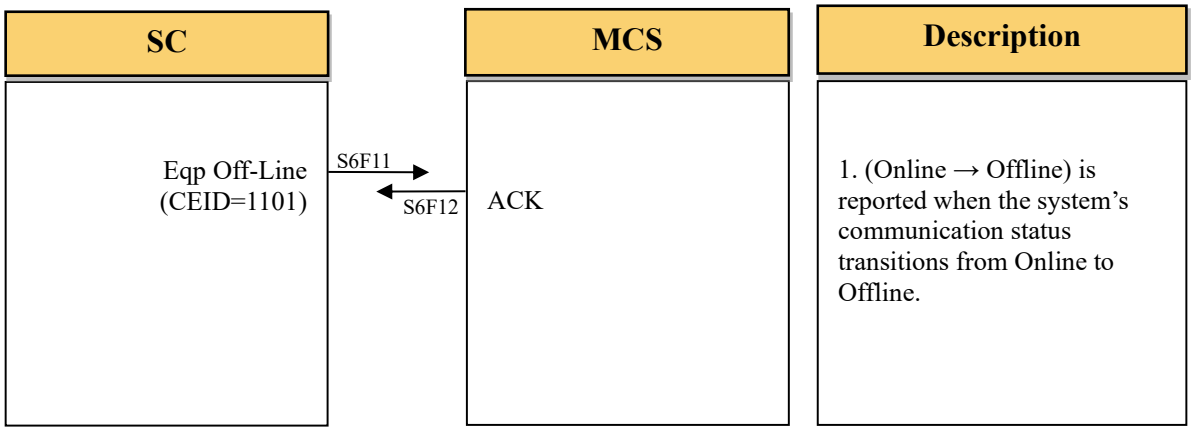
This describes the procedure for switching the SC from offline state to online remote mode when the SC is switched from Offline to Online Remote during operation.



## 4.2. Mode Change

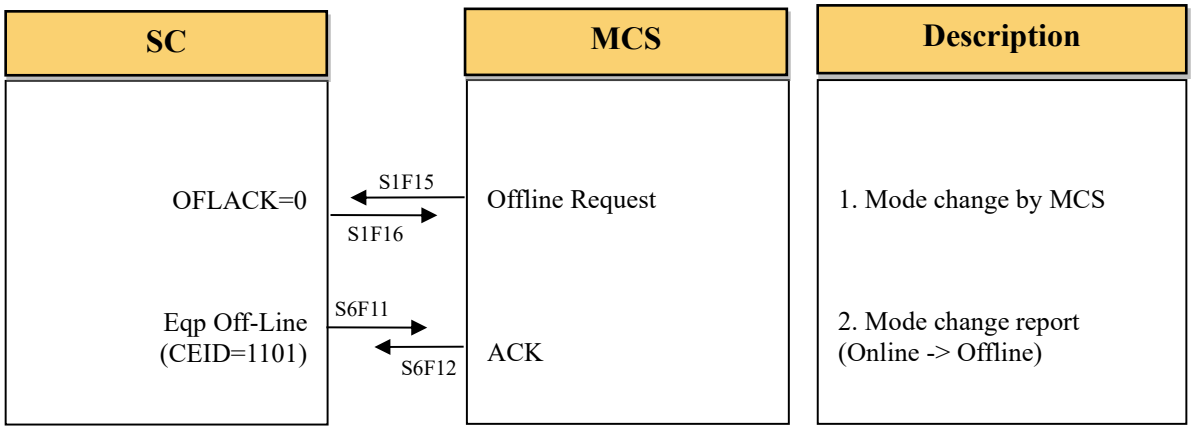
### 4.2.1. On-Line -> Off-Line(By SC)

It is the process in which the SC autonomously controls the transition from Online Remote to Offline mode.



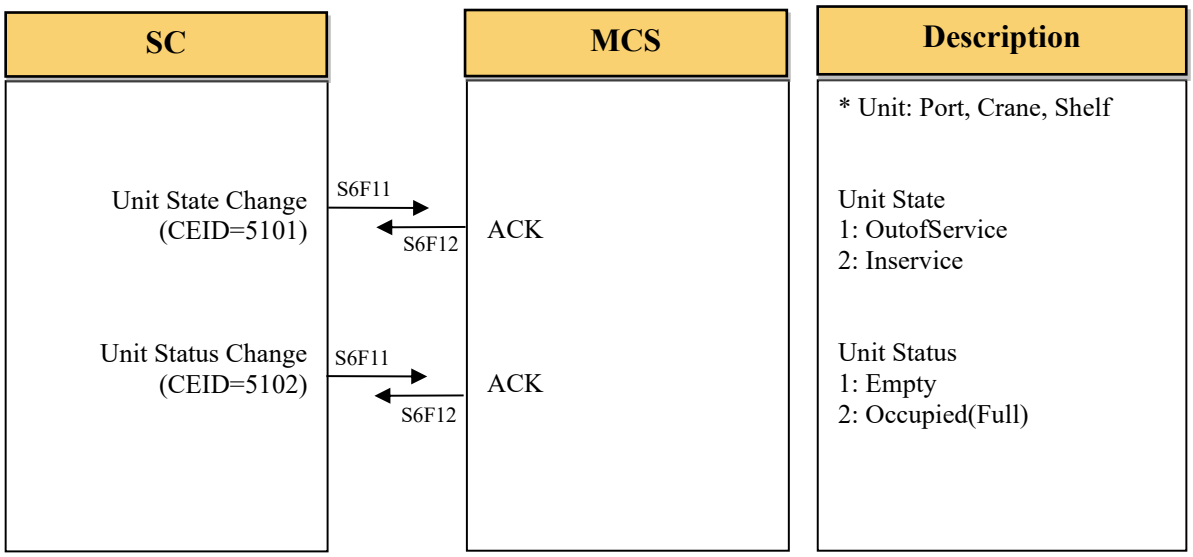

### 4.2.2. On-Line -> Off-Line(By MCS)

It is the process in which the Material Control System (MCS) commands the SC to switch from Online Remote to Offline Mode.



### 4.2.3. SC Unit Event

It is an independent event that occurs each time the unit status of the stocker changes.

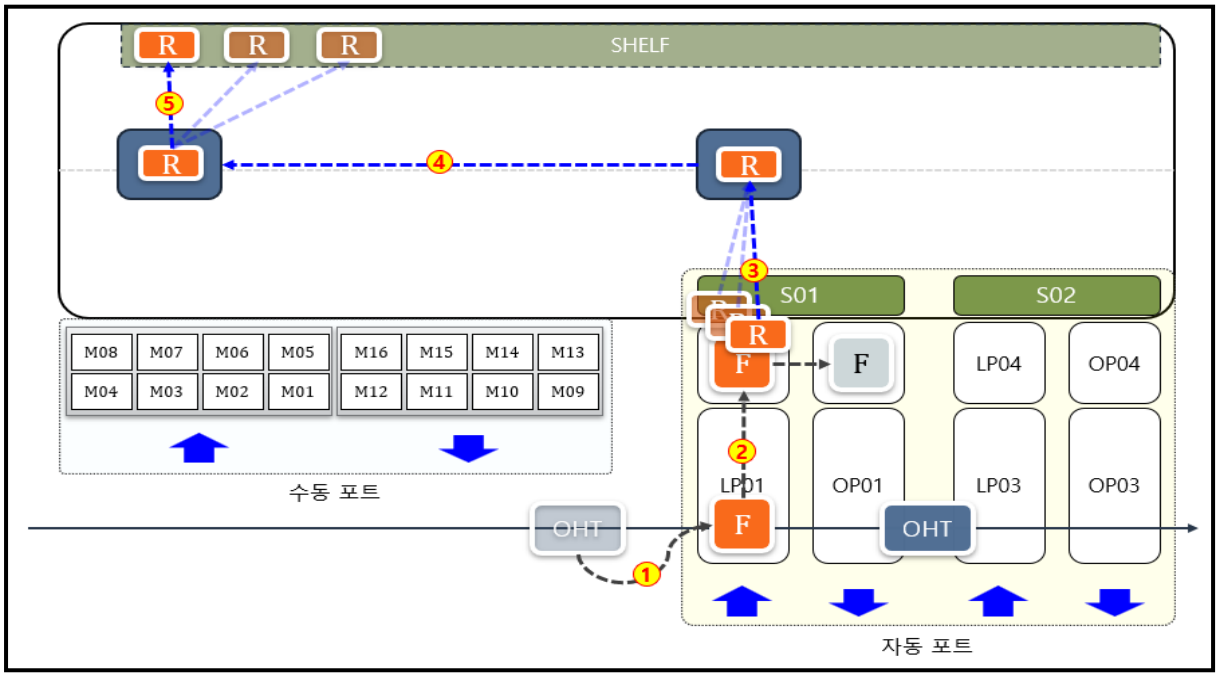


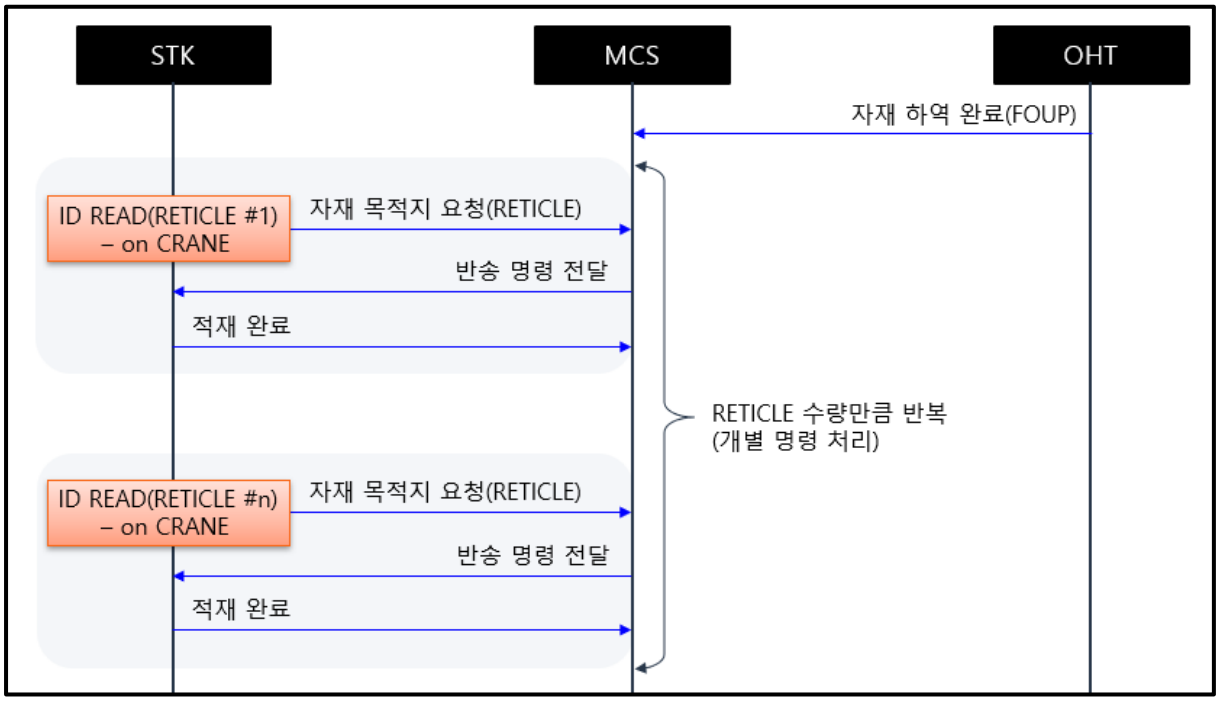
## 4.3. Scenario

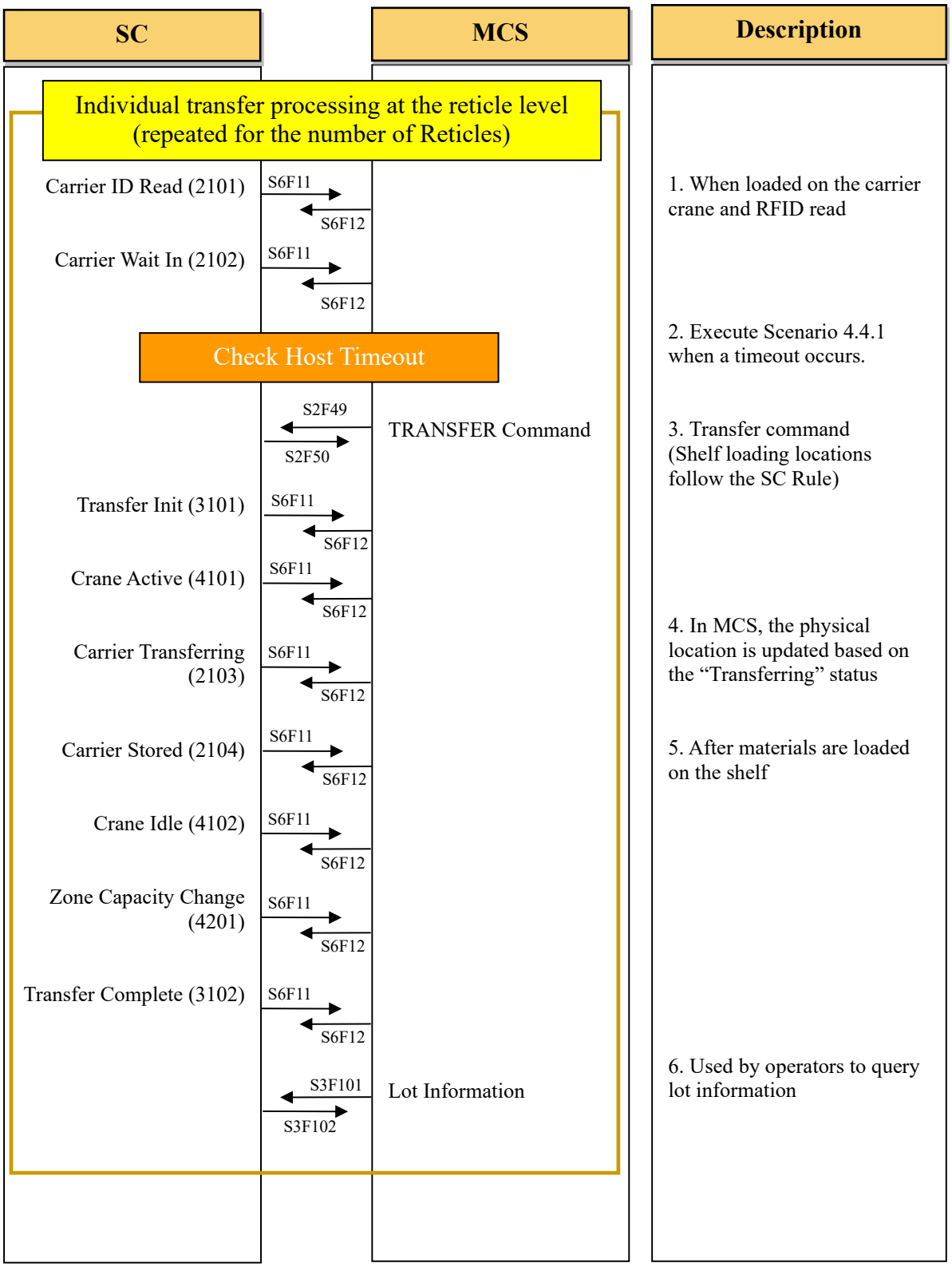
### 4.3.1. Transfer Operation

#### 4.3.1.1. Normal Scenario(Input(crane) => Shelf)

This scenario describes the transfer of a carrier from the input port to a shelf. Since the RFID reader is mounted on the crane, carrier identification is performed after the crane picks up the carrier. The carrier is then stored in the shelf, the zone capacity is updated, and the transfer is completed.

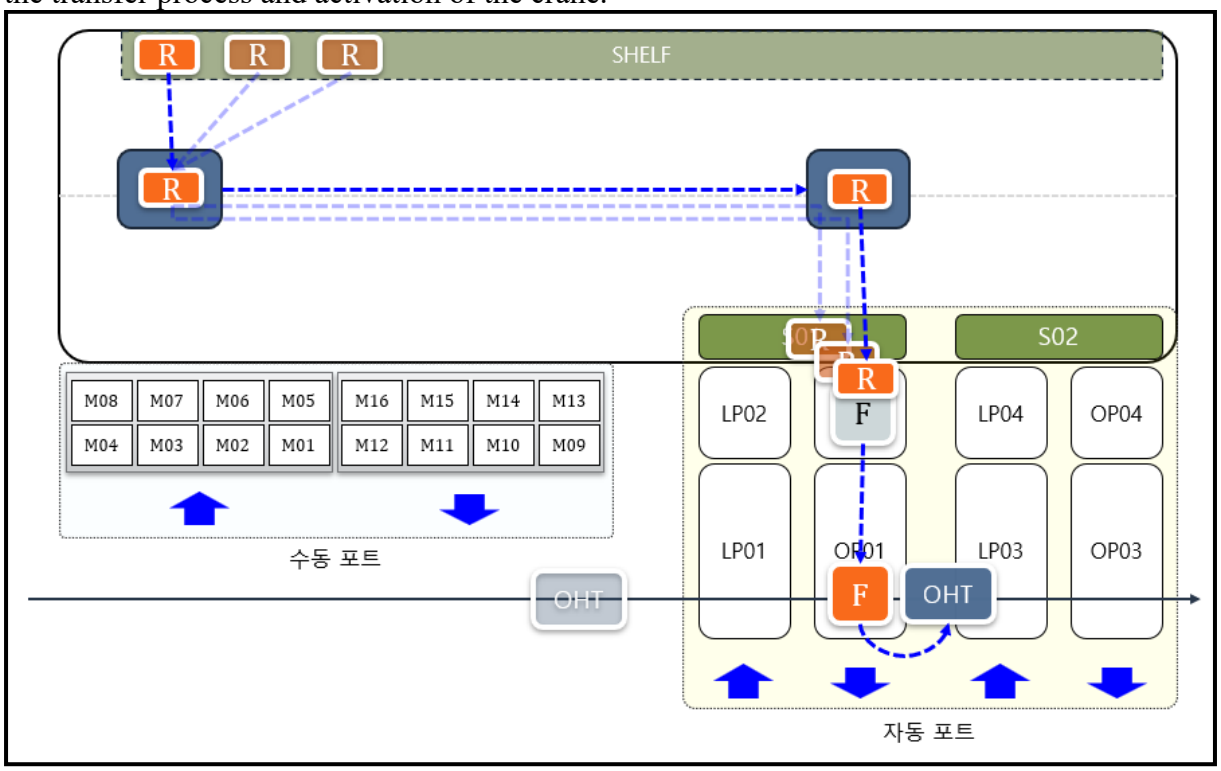


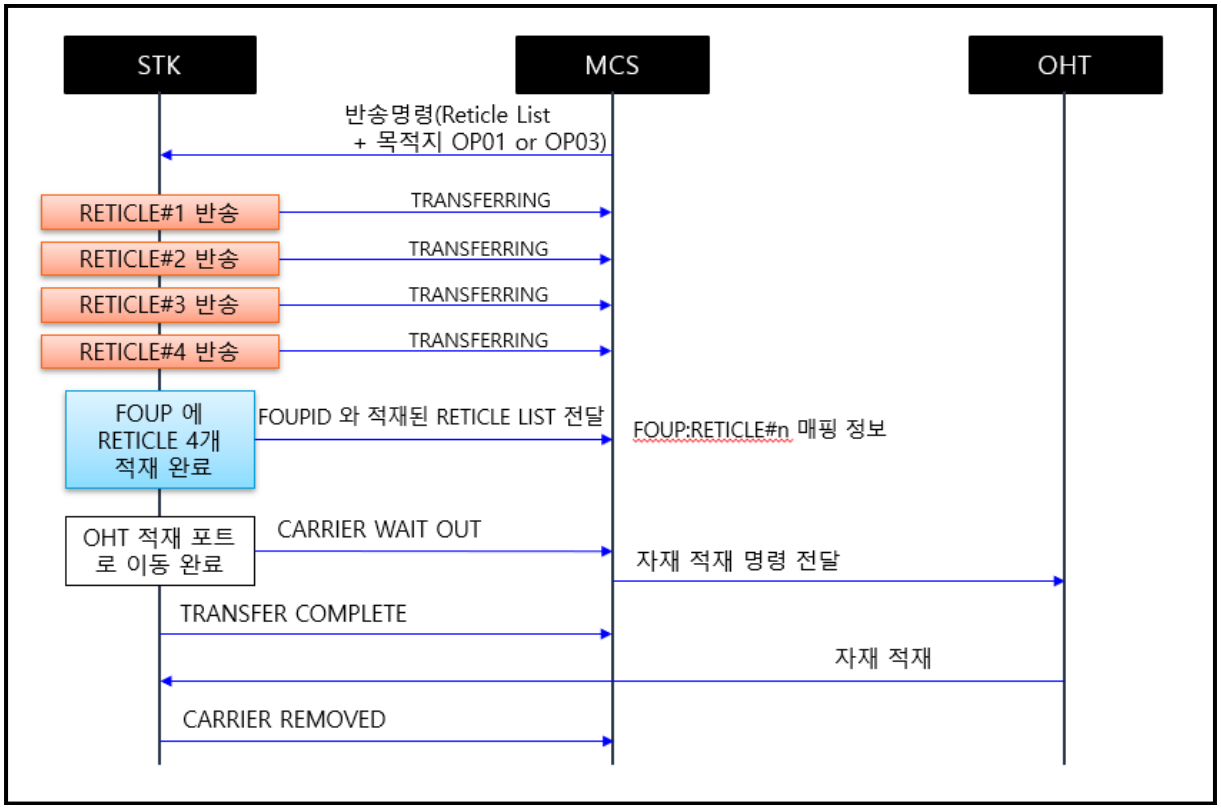



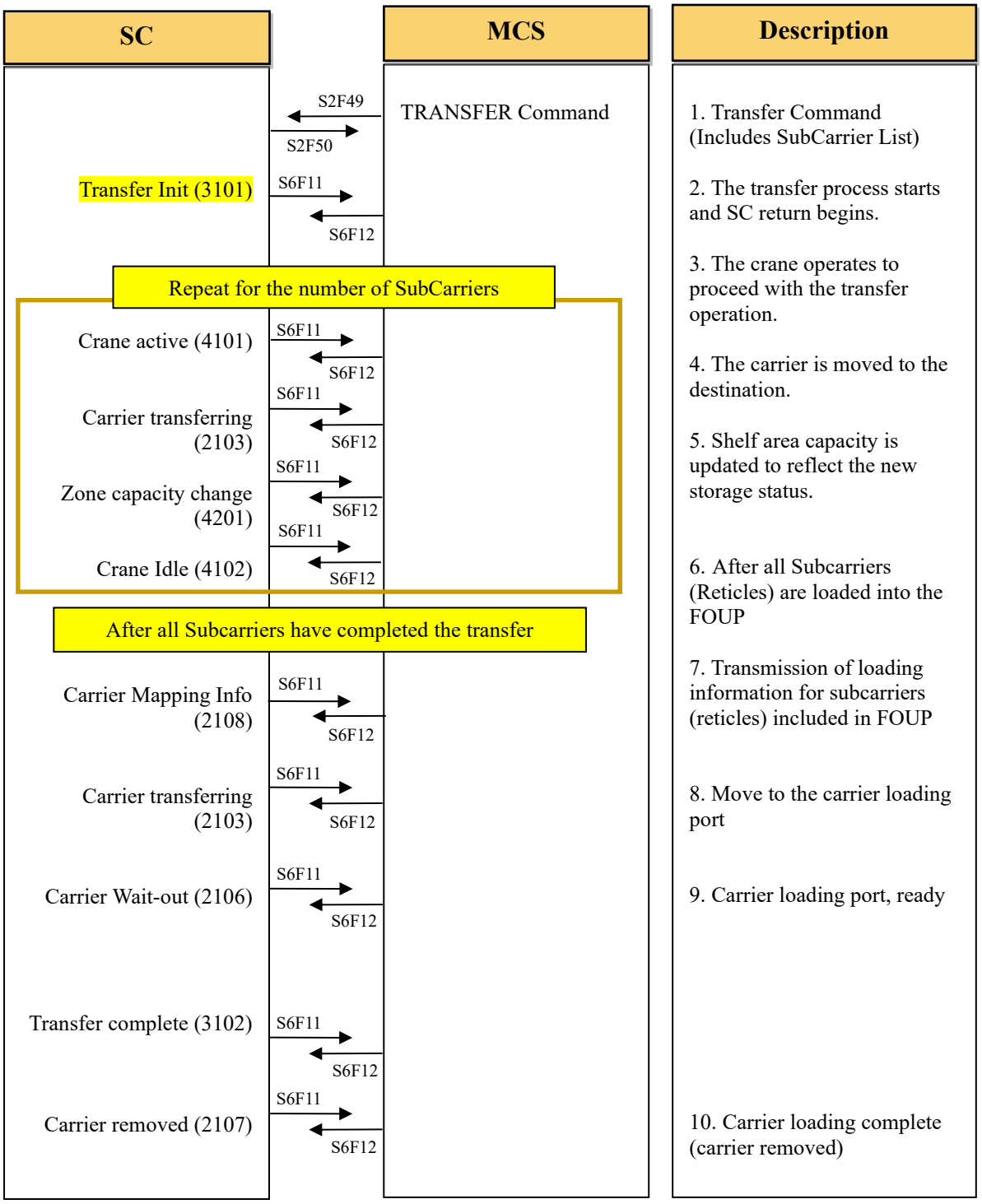

SC
MCS
Description
Individual transfer processing at the reticle level
(repeated for the number of Reticles)
Carrier ID Read (2101)
S6F11
S6F12
1. When loaded on the carrier crane and RFID read
Carrier Wait In (2102)
S6F11
S6F12
Check Host Timeout
2. Execute Scenario 4.4.1 when a timeout occurs.
S2F49
TRANSFER Command
S2F50
3. Transfer command (Shelf loading locations follow the SC Rule)
Transfer Init (3101)
S6F11
S6F12
Crane Active (4101)
S6F11
S6F12
Carrier Transferring (2103)
S6F11
S6F12
4. In MCS, the physical location is updated based on the “Transferring” status
Carrier Stored (2104)
S6F11
S6F12
5. After materials are loaded on the shelf
Crane Idle (4102)
S6F11
S6F12
Zone Capacity Change (4201)
S6F11
S6F12
Transfer Complete (3102)
S6F11
S6F12
S3F101
Lot Information
S3F102
6. Used by operators to query lot information

#### 4.3.1.2. Normal Scenario (Shelf => Output)

This scenario describes the process of transferring a carrier from the shelf to the output port. The sequence begins with a transfer command being issued, followed by the initialization of the transfer process and activation of the crane.

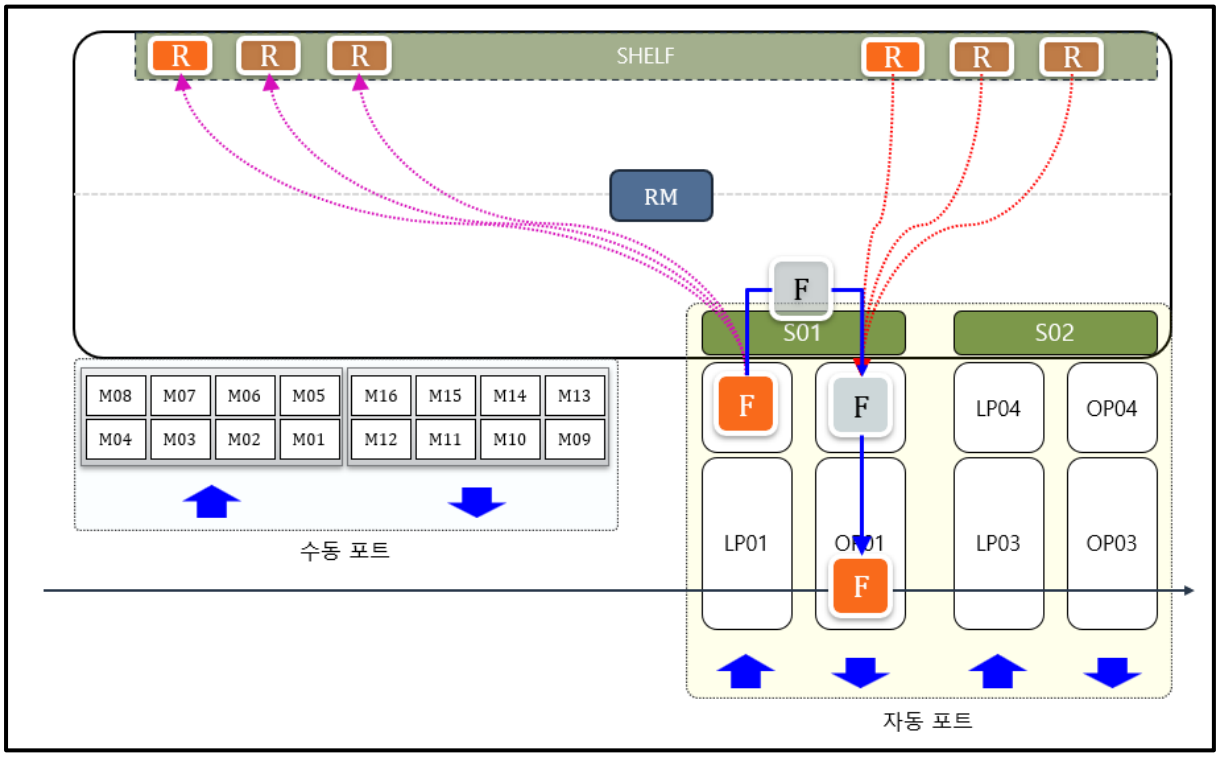


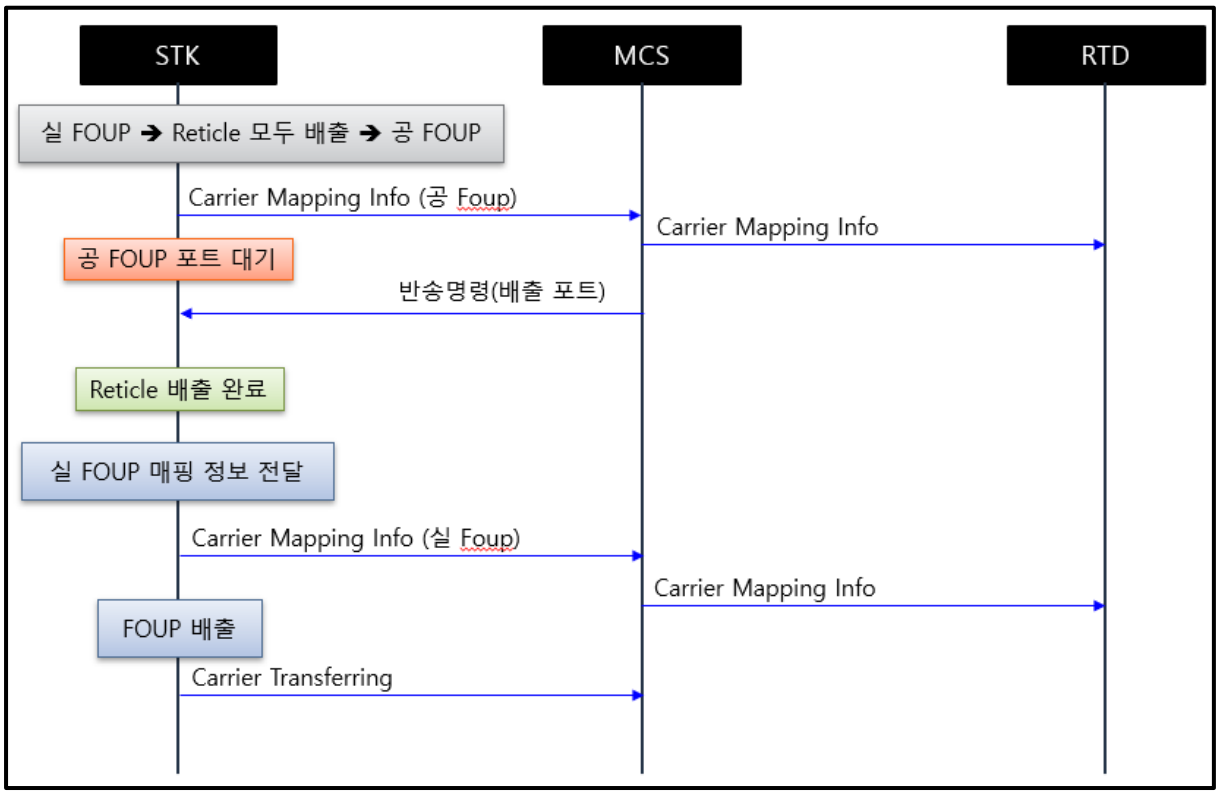



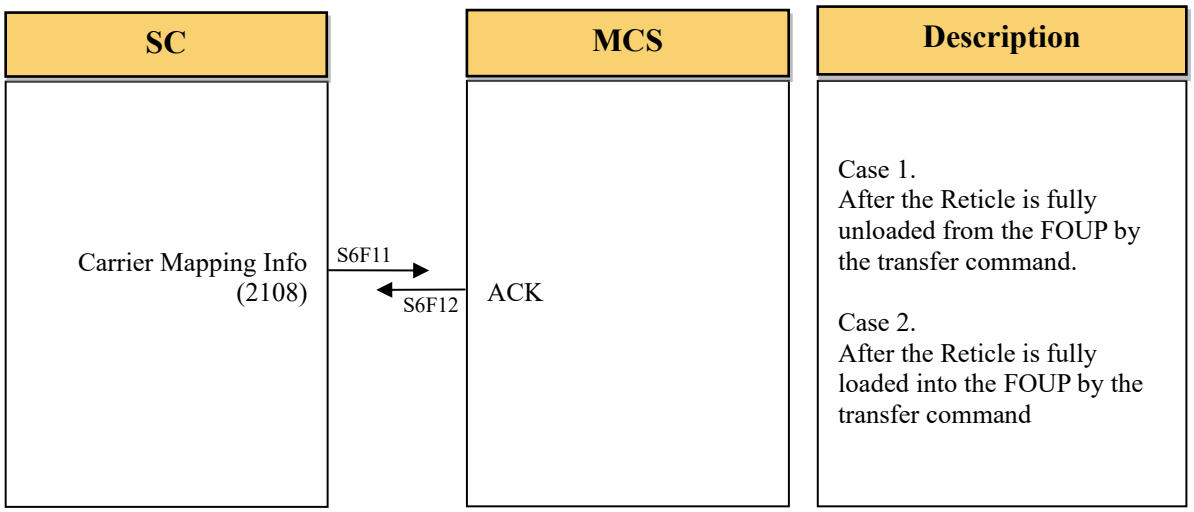

SC
MCS
Description
S2F49
TRANSFER Command
S2F50
1. Transfer Command (Includes SubCarrier List)
Transfer Init (3101)
S6F11
S6F12
2. The transfer process starts and SC return begins.
Repeat for the number of SubCarriers
3. The crane operates to proceed with the transfer operation.
Crane active (4101)
S6F11
S6F12
4. The carrier is moved to the destination.
Carrier transferring (2103)
S6F11
S6F12
Zone capacity change (4201)
S6F11
S6F12
5. Shelf area capacity is updated to reflect the new storage status.
Crane Idle (4102)
S6F11
S6F12
6. After all Subcarriers (Reticles) are loaded into the FOUP
After all Subcarriers have completed the transfer
Carrier Mapping Info (2108)
S6F11
S6F12
7. Transmission of loading information for subcarriers (reticles) included in FOUP
Carrier transferring (2103)
S6F11
S6F12
8. Move to the carrier loading port
Carrier Wait-out (2106)
S6F11
S6F12
9. Carrier loading port, ready
Transfer complete (3102)
S6F11
S6F12
Carrier removed (2107)
S6F11
S6F12
10. Carrier loading complete (carrier removed)

### 4.3.1.3. Carrier Mapping Information

This section describes the Carrier Mapping Information report (CEID 2108). After all reticles are loaded into the FOUP by the transfer command, the SC reports the carrier-to-reticle mapping to the MCS.



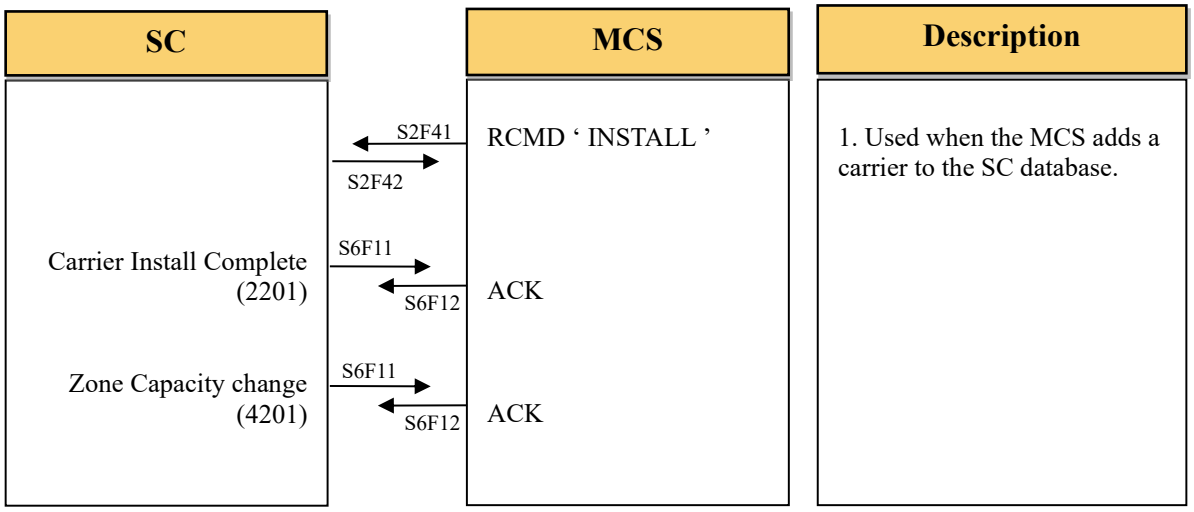




SC
MCS
Description
Carrier Mapping Info
(2108)
S6F11
S6F12
ACK
Case 1.
After the Reticle is fully unloaded from the FOUP by the transfer command.
Case 2.
After the Reticle is fully loaded into the FOUP by the transfer command

### 4.3.2. Data Management

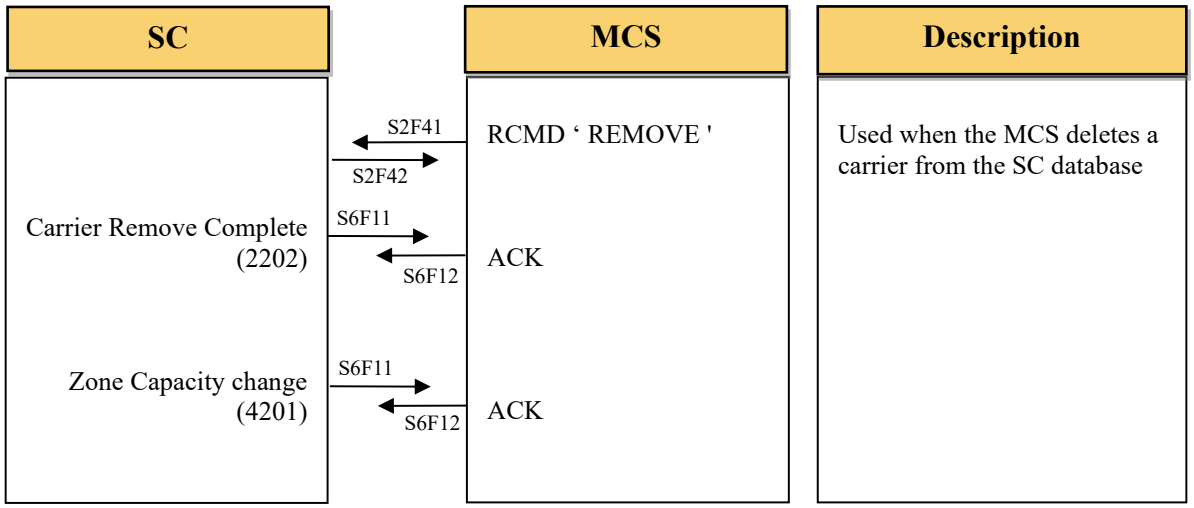
#### 4.3.2.1. Install Command

The Install Command is an instruction sent from the Material Control System (MCS) to the Stocker Controller (SC), directing that a specific carrier be stored in a designated storage location within the stocker.



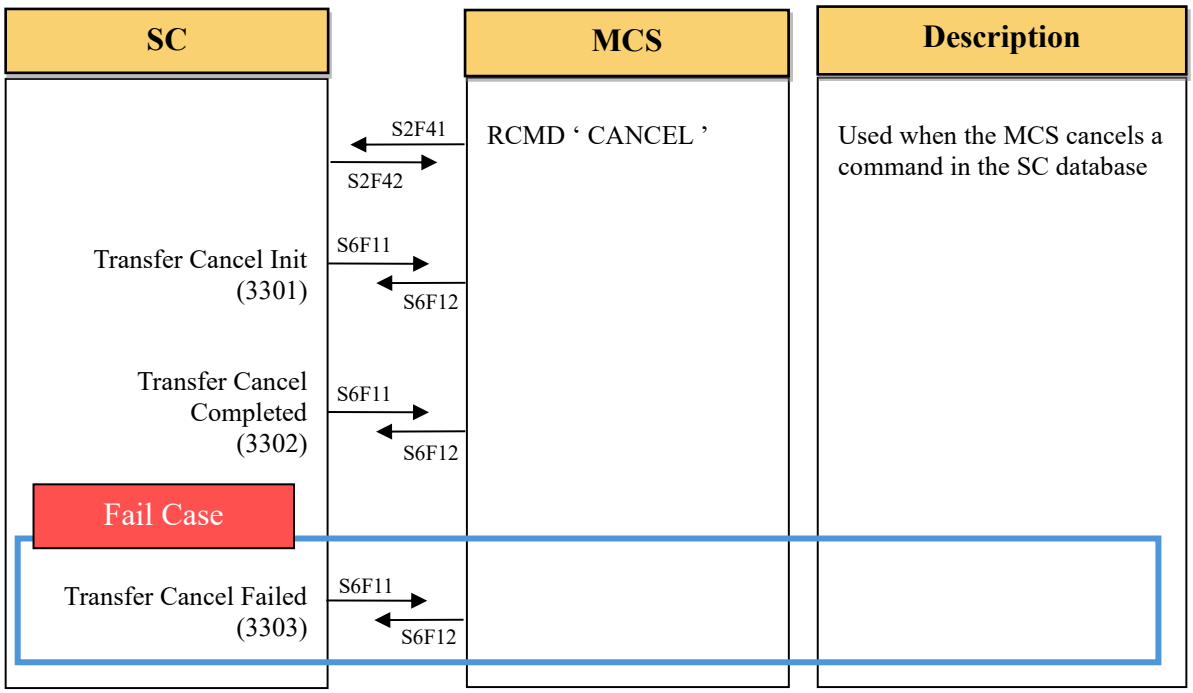

#### 4.3.2.2. Remove Command

"Remove Command" is a command sent from the Material Control System (MCS) to the Stocker Controller (SC) to remove a carrier from a designated location within the stocker.

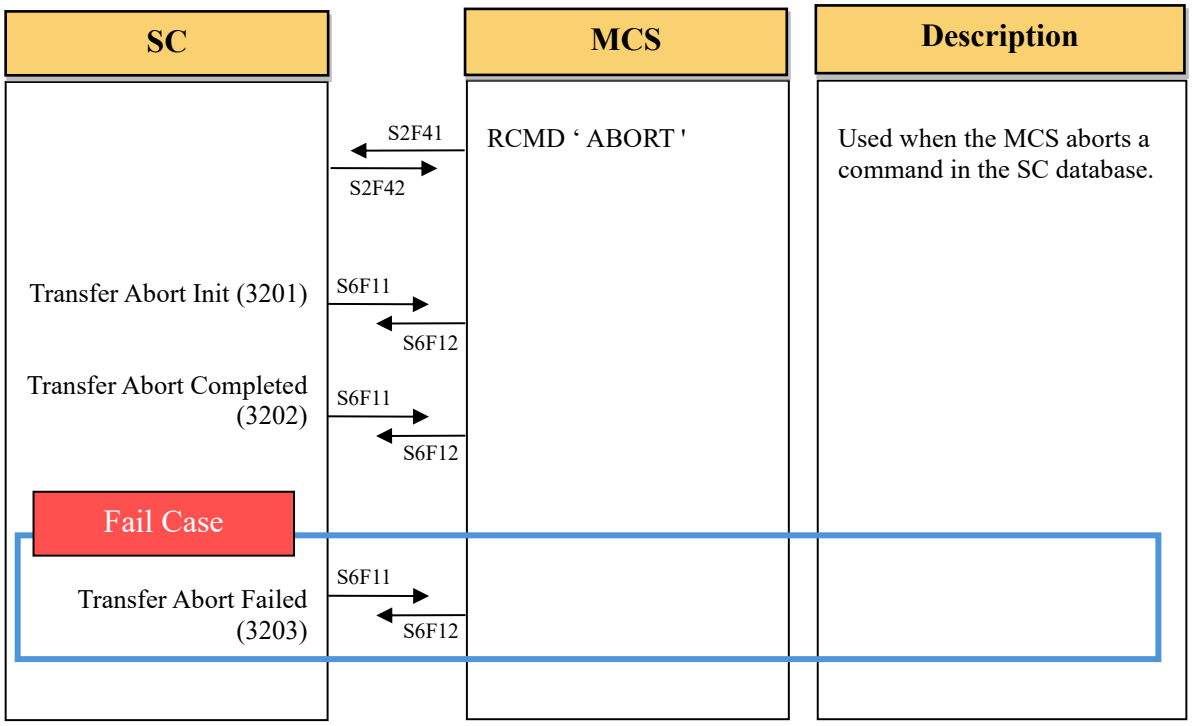


### 4.3.3. Remote Command

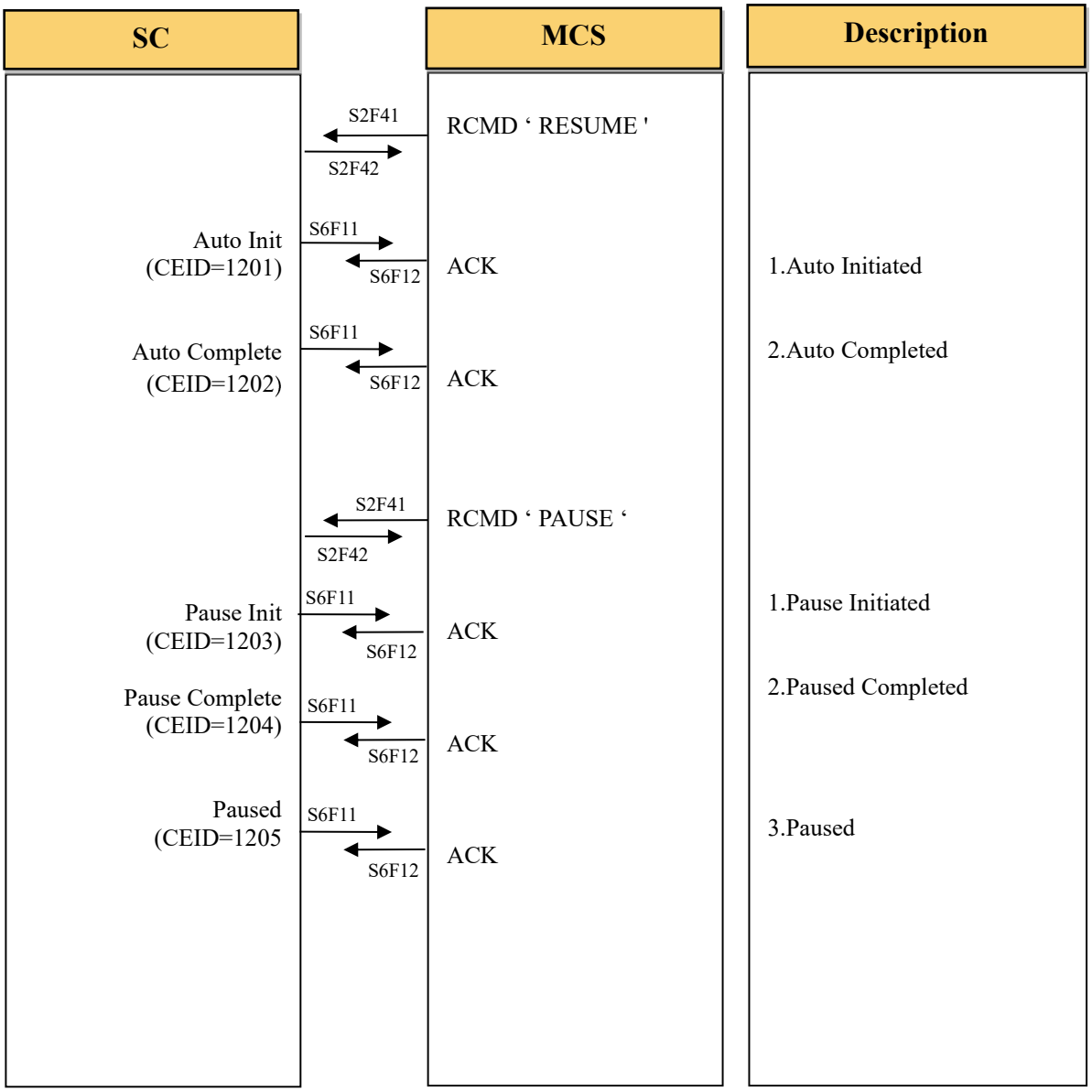
#### 4.3.3.1. Cancel




#### 4.3.3.2. Abort



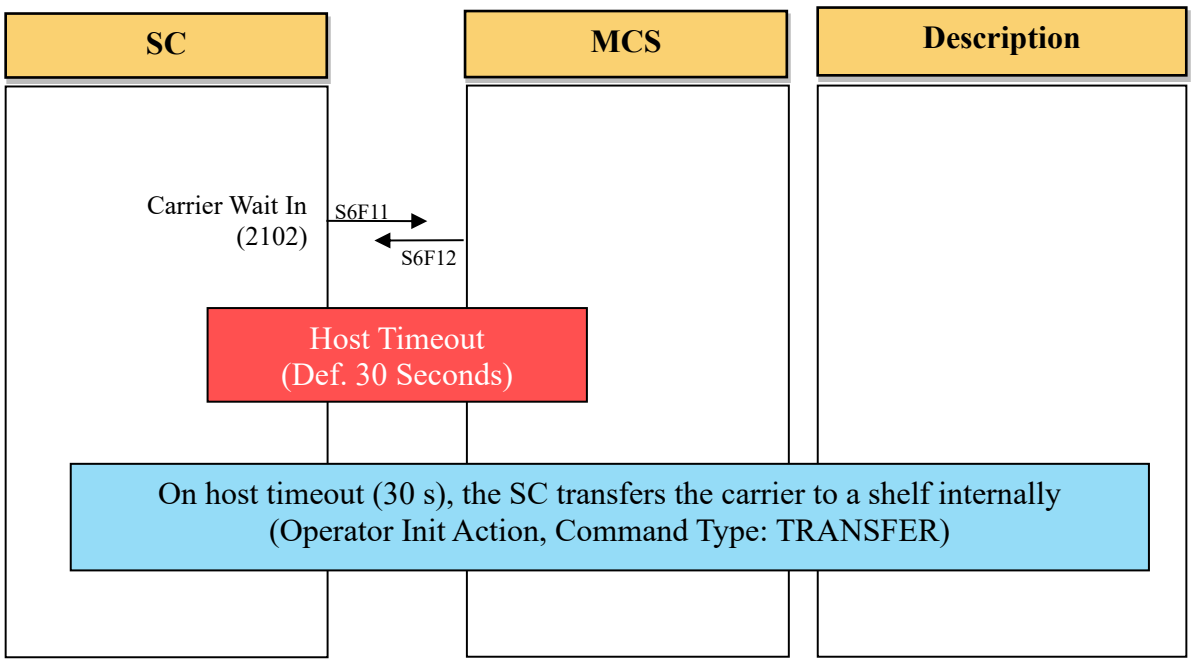
#### 4.3.3.3. SC Pause/Resume



## 4.4. Abnormal Process

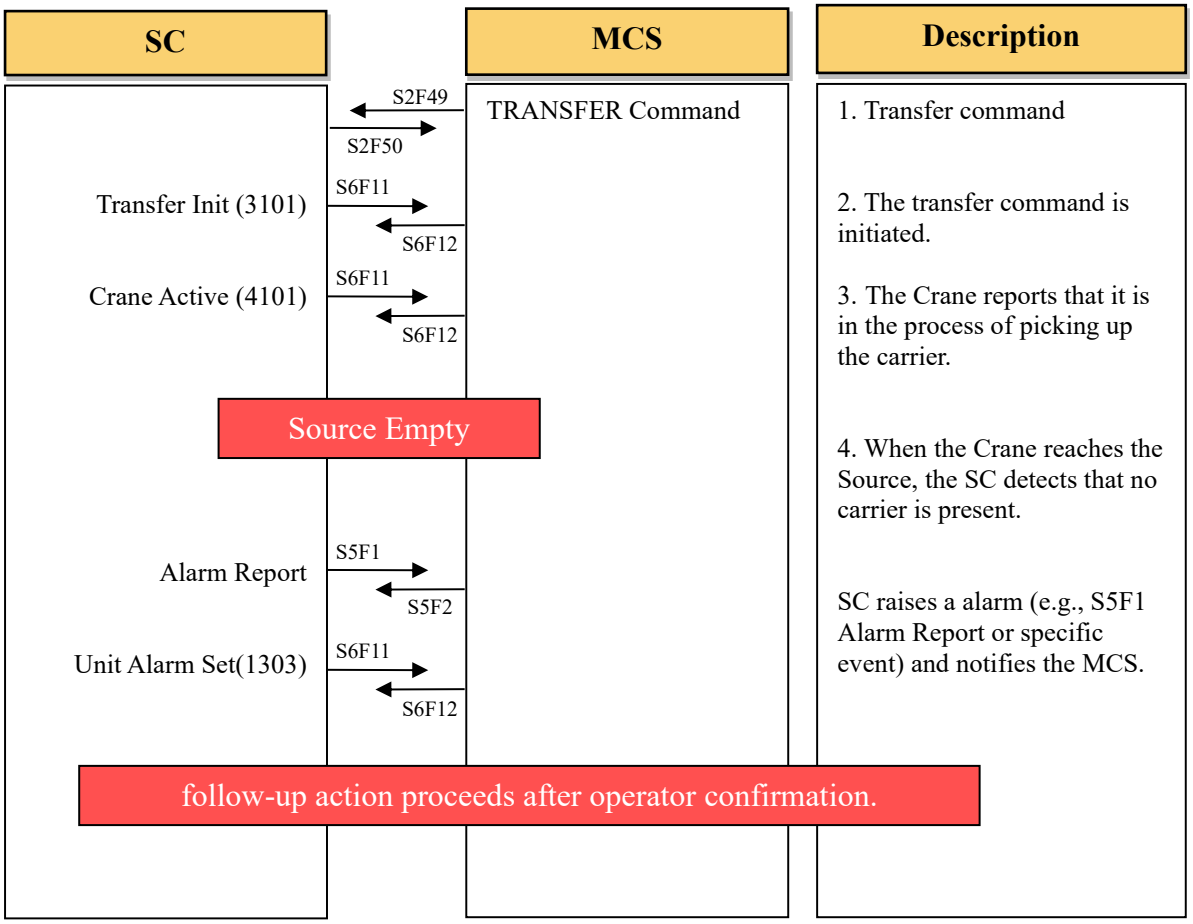
### 4.4.1. Host Timeout

A scenario where a ‘Wait In’ occurs in the Stocker Controller, but a timeout happens because the MCS does not received Transfer Command.



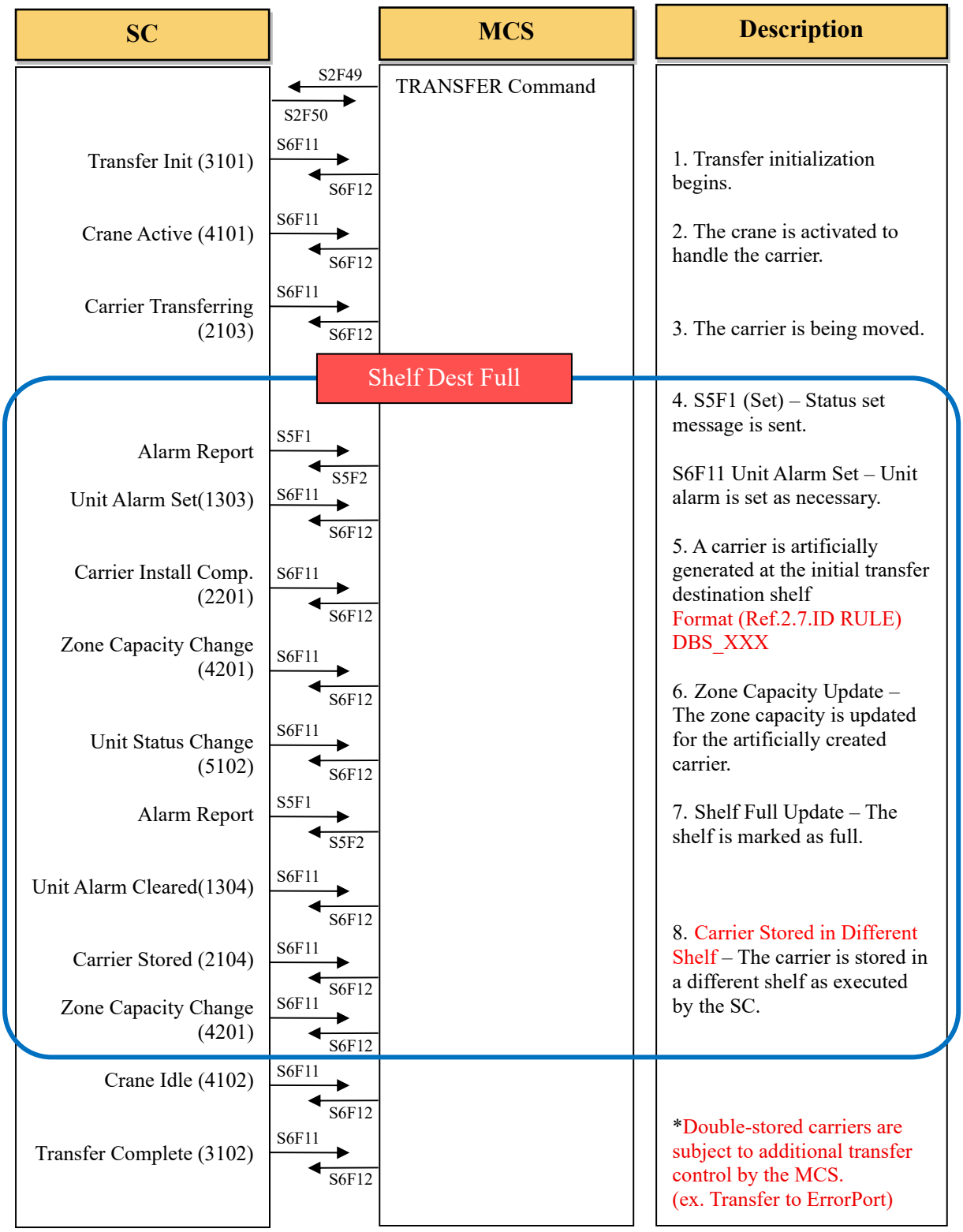
### 4.4.2. Source Empty

This scenario represents the case where the Crane moves to the designated Source location under a Transfer Command, but no reticle is present. Unlike a general stocker, the Reticle Stocker handles reticles as a group within a carrier (FOUP), so automatic recovery is not possible. The SC raises an alarm, and operator confirmation is required before the operation can be resumed.



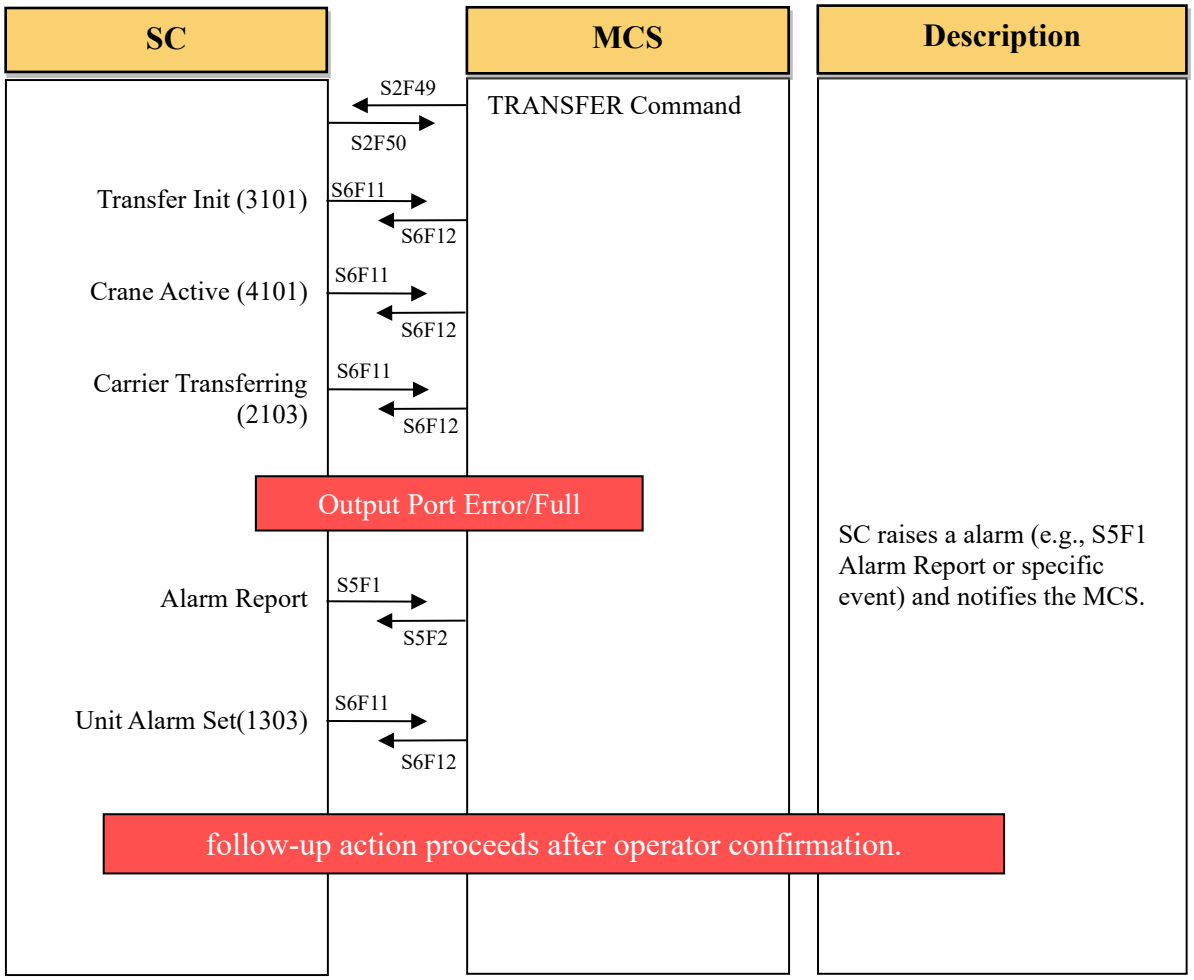
### 4.4.3. Shelf Destination Full(Double Store)

This scenario describes the handling of a carrier during a transfer operation when the initial transfer destination shelf is unexpectedly full. The system updates the zone capacity for the shelf and marks it as full before storing the carrier in an alternative shelf.



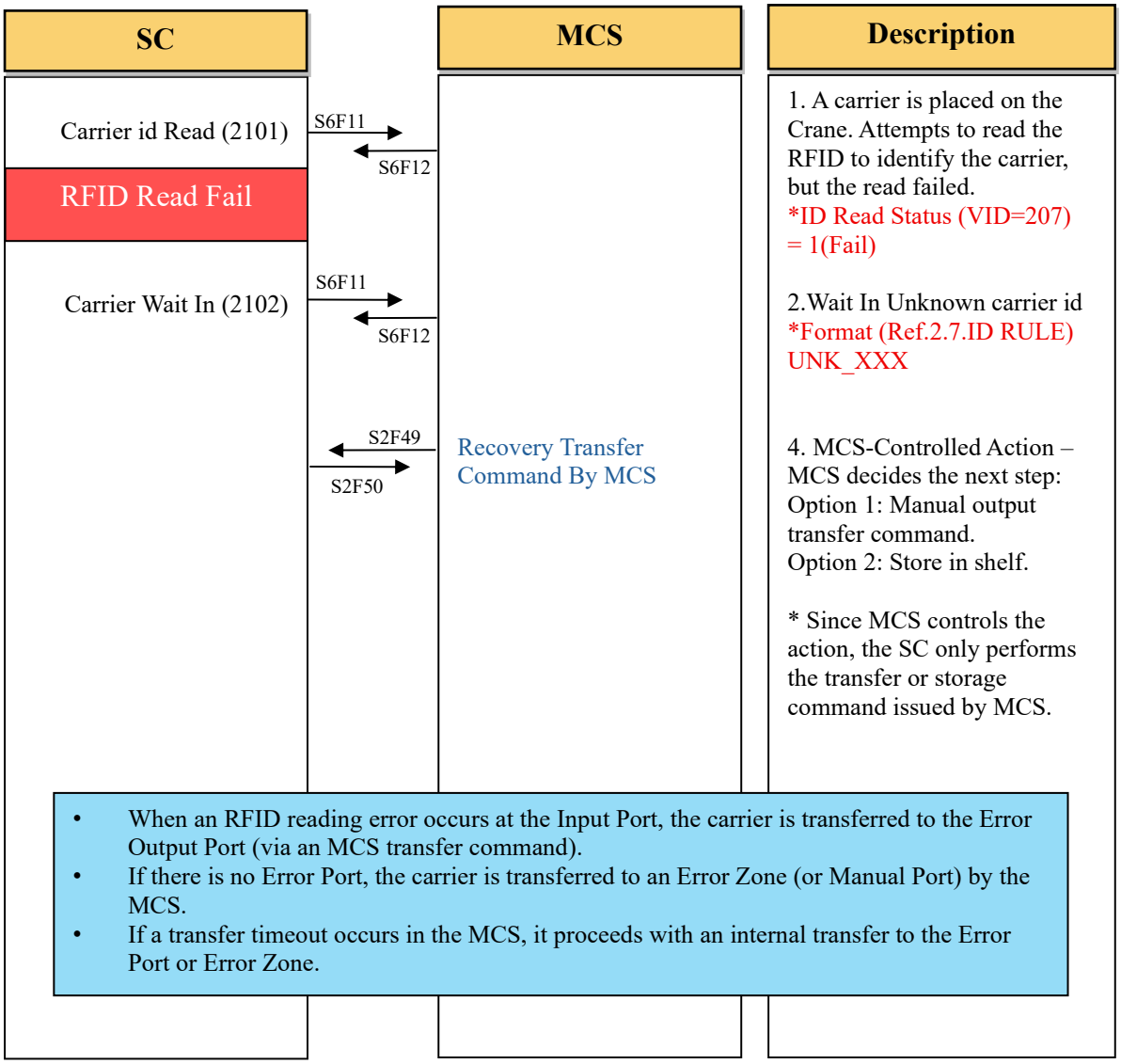
### 4.4.4. Output Port is not Available

This scenario describes the case where the designated Output Port becomes unavailable (e.g., down or in an abnormal state) while reticles are being transferred to the port. Unlike a general stocker, the transfer cannot be recovered automatically because the reticles of the carrier (FOUP) may be partially loaded. The SC raises an alarm, and operator confirmation is required before the operation can be resumed.



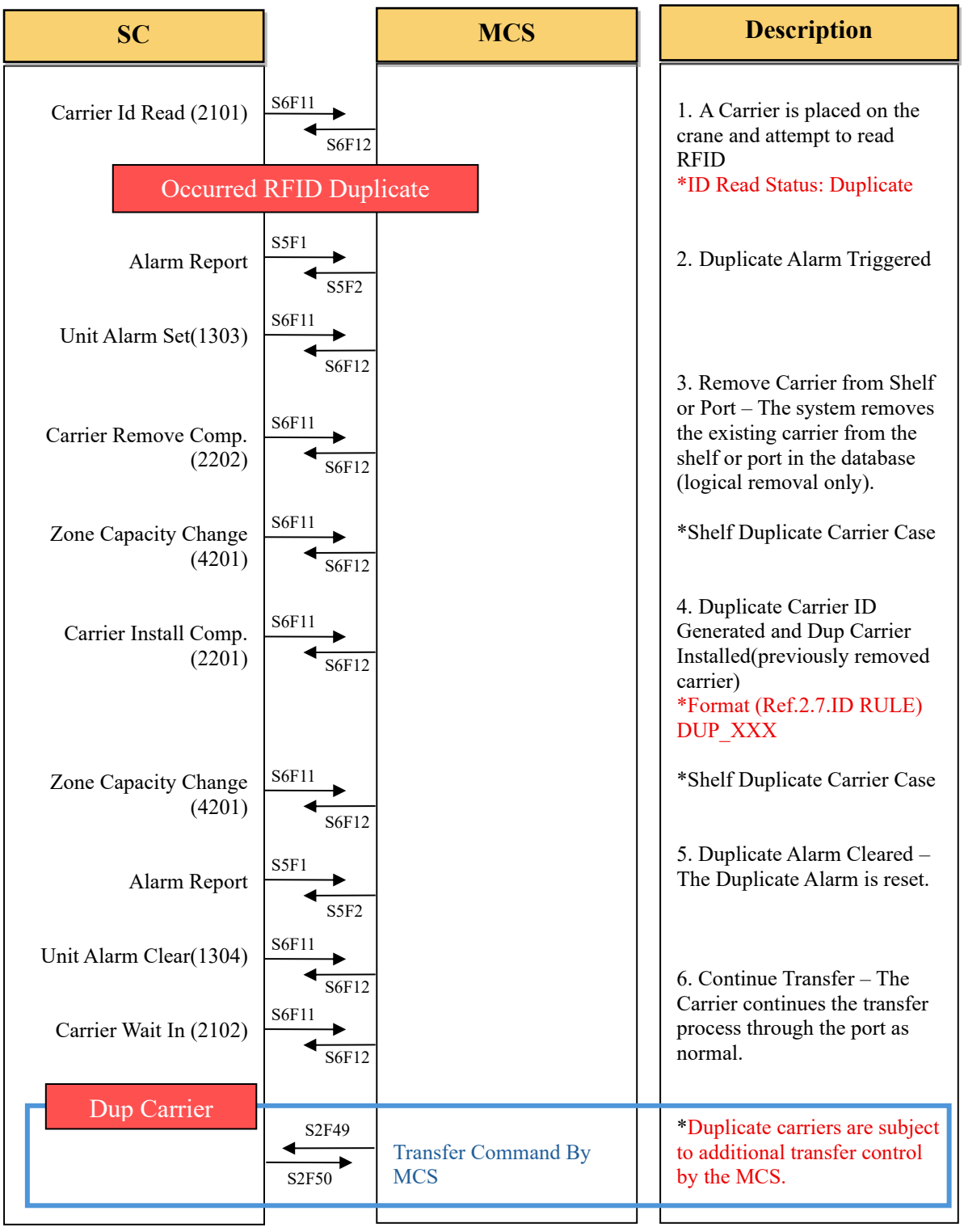
### 4.4.5. RFID Reading Error(Crane)

This scenario describes the handling of a carrier when RFID reading by the crane fails after picking up the carrier from the input port. The MCS determines the subsequent action — either a manual output transfer or storage in a shelf — and the SC executes the transfer command issued by the MCS.



### 4.4.6. RFID Duplicate Error(Crane)

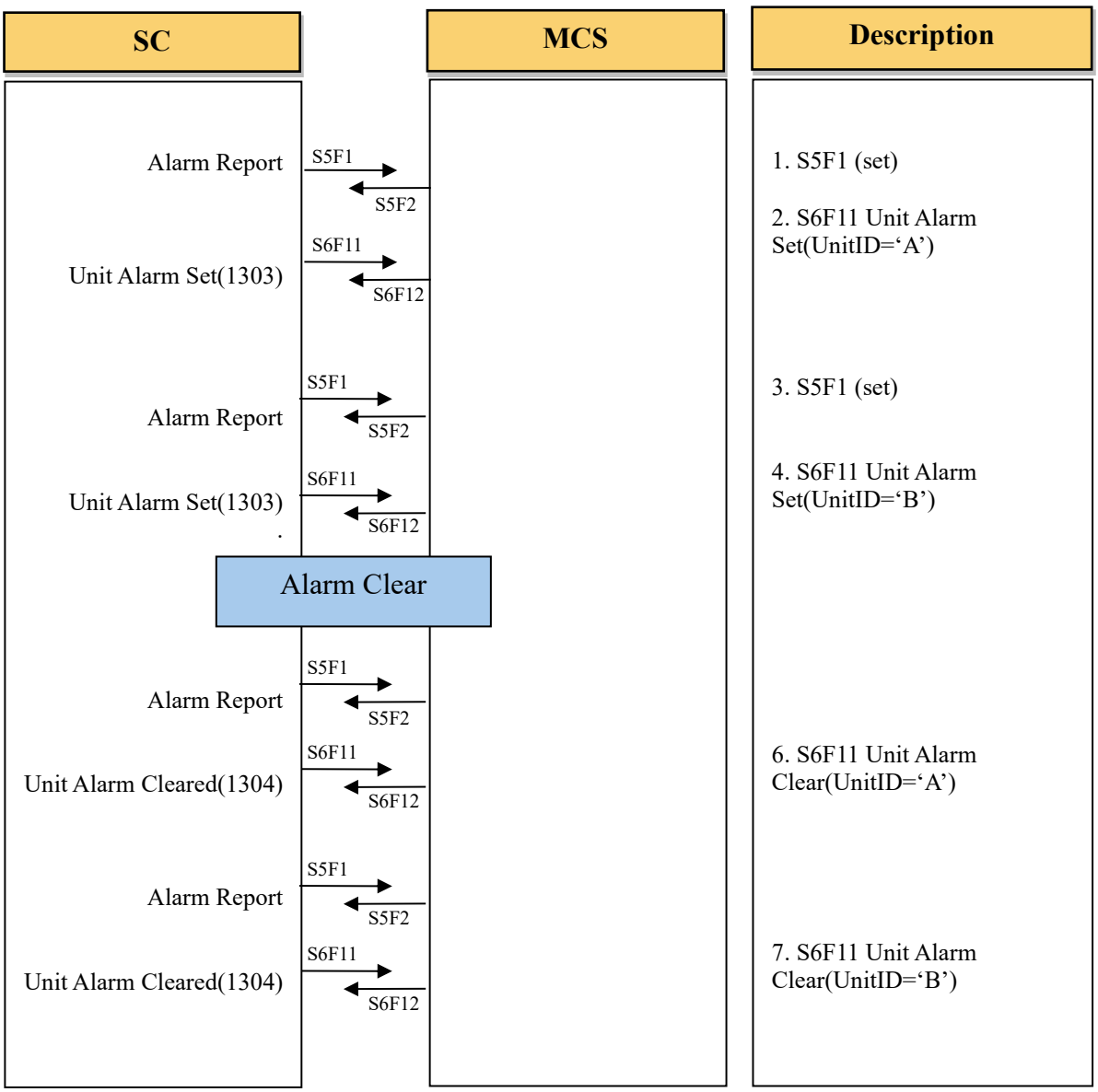
This scenario describes the handling of a carrier when a duplicate RFID is detected by the crane after pickup the carrier from the input port. The MCS determines the subsequent action — either a manual output transfer or storage in a shelf — and the SC executes the transfer command issued by the MCS.



## 4.5. Alarm

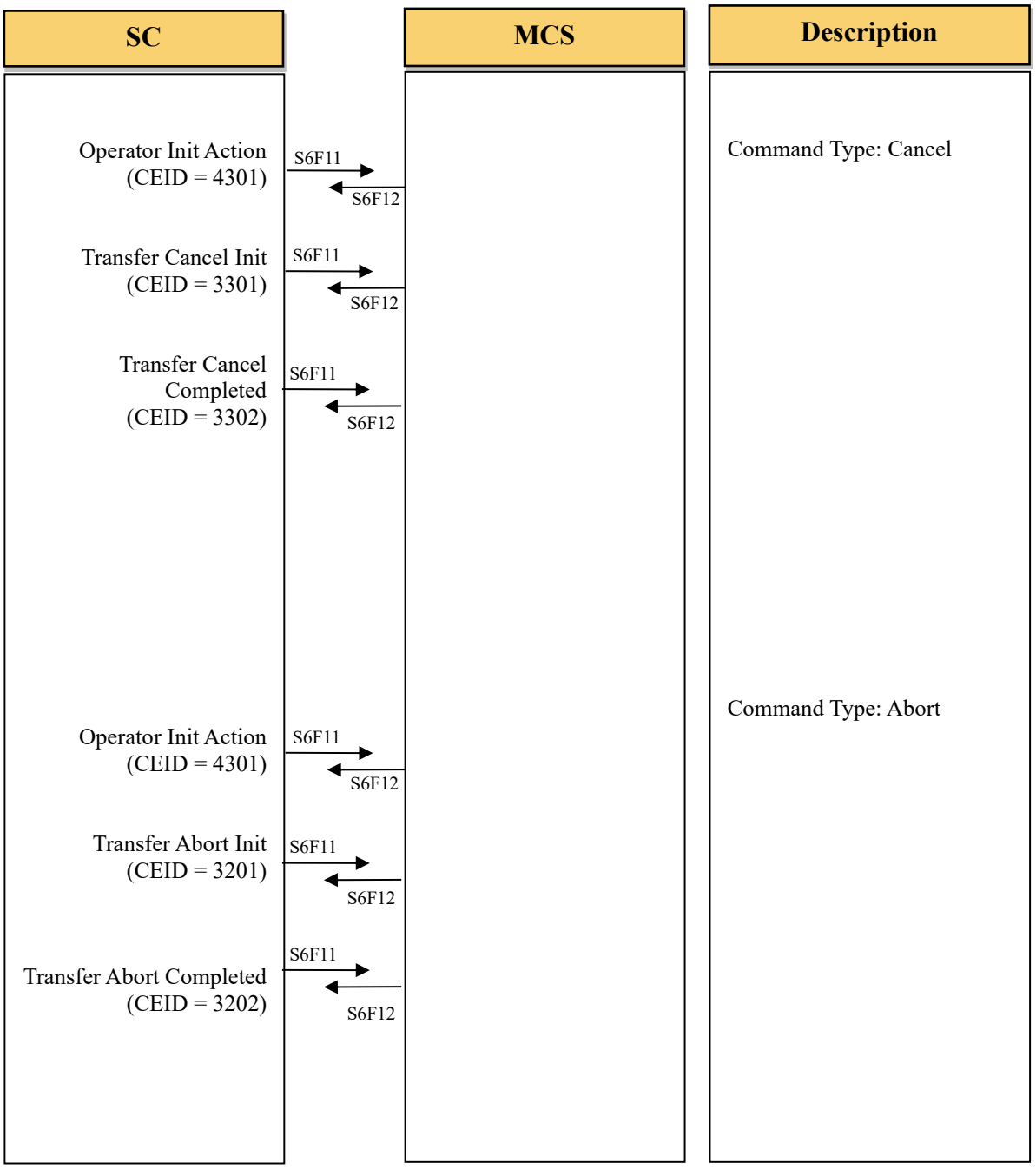
### 4.5.1. Alarm Set/Clear

This scenario describes the procedure for reporting situations where an **alarm is set (activated) or cleared (released)** in the system.
When an abnormal condition occurs in a unit or process, the system sets an alarm and reports the alarm occurrence event to the host.



## 4.6. Operator Scenario

### 4.6.1. Operator(Command Type-Cancel, Abort)-SC Manual Cancel



### 4.6.2. Operator(Command Type-Transfer)-SC Manual Transfer

