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OHT-SEM
[SDI M라인]

Basic Specification
Version 1.5

2018.07.24

물류자동화그룹
설비제어팀

삼성SDI SAMSUNG 삼성SDS SAMSUNG

Document Control

No.	Release Date	Author	Version	Release Notes
1	2017.11.24	Soonhan.Lee	1.0	
2	2017.11.25	Soonhan.Lee	1.1	-. RPTID '7' 삭제(p22) : Port Event -. CarrierType 수정(p31) 1 = CAN, 2 = CAP, 3 = ZZZ, 4 = XXX, 5=YYY, 6=KKK
3	2018.01.16	ByungGul.Je	1.2	1. VID added 1) VID = 63, EMPTYFLAG 2) VID = 96, LotID 3) VID = 100, BatchID 3) VID = 101, ProcessID 4) VID = 102, CARRIERSTACKINFO
4.	2018.03.23	ByungGul.Je	1.3	1. VID = 103, Quantity added
5	2018.04.19	KyuIl.Kim	1.4	1. VID = 54 VehicleStatus added 2. CEID = 611 VehicleStatusChanged added 3. RPTID = 16 added
6	2018.07.24	ByungSeo.Kim	1.5	1. VID = 104 VehiclePositionInfo added VID = 105 VehiclePositions added 2. CEID = 505 VehiclePositionInfos added 3. RPTID = 17 added

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1 SPECIFICATION DEFINITION

This document is applied to Samsung Electro-Mechanics, defined as the communication specification to be used in online communication with the intrabay/interbay transport system.

Complement all the modifications that will be conducted by the Samsung SDS.

1.1 Referenced Documentation

- SEMI E5 : SEMI EQUIPMENT COMMUNICATIONS STANDARD 2 MESSAGE CONTENT (SECS-II)
- SEMI E30 : GENERIC MODEL FOR COMMUNICATIONS AND CONTROL OF MANUFACTURING EQUIPMENT (GEM)
- SEMI E37 : HIGH-SPEED SECS MESSAGE SERVICES (HSMS) GENERIC SERVICES
- SEMI E37.1 : HIGH-SPEED SECS MESSAGE SETVICES SINGLE-SESSION MODE (HSMS-SS)
- SEMI E82 : SPECIFICATION FOR INTERBAY/INTRABAY AMHS SEM (IBSEM)

1.2 State Model List

The state model to be included in the TSC is described in both SEM and GEM. The following is a list of those state models

- Communication State Model (refer to GEM 3.2)
- Controller State Model (refer to GEM 3.3)
- TSC State Model (refer to Chapter2)
- Transfer Command State Model (refer to Chapter2)
- Carrier State Model (refer to Chapter2)
- Vehicle State Model (refer to Chapter2)

※ The TSC also contains an HSMS-SS state model (Refer to section 5 of SEMI E37.1 HSMS-SS)

1.3 Technical Terms

- OHT (MGV): Automatic (manual), the device's Vehicle
- OHS: Overhead Hoist Shuttle

- Loader Port: Interface position of equipment where cassette is delivered
- Transfer Port: When Cassette is the emergence, on the point of the transfer system cassette ownership is changed
- Cassette: Container glass is put
- Cassette ID: ID cassette is separated by

1.4 Basic Communication Standard

1.4.1 Communication Protocol

- Communication: TCP/IP
- Communication Speed: 10/100Mbps

1.4.2 Overview of HSMS message

Byte	Description
0~3 Bytes	Message length (Notify message header and bytes of message text)
4~13 Bytes	Message header
14~n Bytes	Message text (Format notified on PType of message header)

1.4.3 Message Format

Length (0~3 bytes)	**Header** (4~13 bytes)	**Text** (14~n bytes)

- Message Length Field: The Format of the message Length is 4 byte unsigned integer, writes byte of message header and message text
- Message Header Field

Bytes	Description
~1	Session ID (Device ID)
2	Header Byte 2
3	Header Byte 3
4	PType
5	SType

6~9	System Bytes

※ PType, SType = 0, text contains valid SECS-II message

1.5 Communication Standard Summary

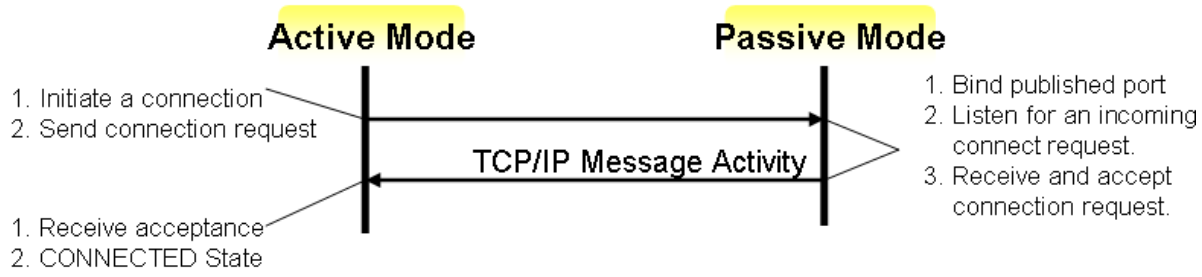
No.	Symbol	Parameter Name	Description	Default	Range	Resolution
1	N.A.	Host Name	MCS Name	TBD		N.A.
2	N.A.	TCP Port Number	TCP Port Number	TBD	1-65535	
3	N.A.	MCS Side IP Address	MCS IP Address	TBD		
4		TSC Side IP Address	TSC IP Address	TBD		
5	N.A.	Connection Mode	Connection Mode	Passive for SC	Passive only for Eqp. side	N.A.
6	T3	Reply Timeout	Reply Message timeout occur	45 sec	1-120 sec	1 sec
7	T5	Connection Separation Timeout	Trial time interval when Connection is failed	10 sec	1-240 sec	1 sec
8	T6	Control Timeout	Control message timeout occur	5 sec	1-240 sec	1 sec
9	T7	Connection Idle Timeout	Before connection failure first connection is succeed for using to HSMS communication occurred, The time until	10 sec	1-240 sec	1 sec
10	T8	Network Character Timeout	In a message, timeout happened between the connection characters	5 sec	1-120 sec	1 sec
11	N.A.	Maximum Message Size	When Communication, The maximum Message Size to send or received	4096		
12	N.A.	Maximum Concurrent Opened Transactions	After access to HSMS The maximum number the concurrent possible transactions	1024		
13	N.A.	Number of Device ID to be used	Number of max equipment to be connected to HSMS	9		

※ TBD = To be defined

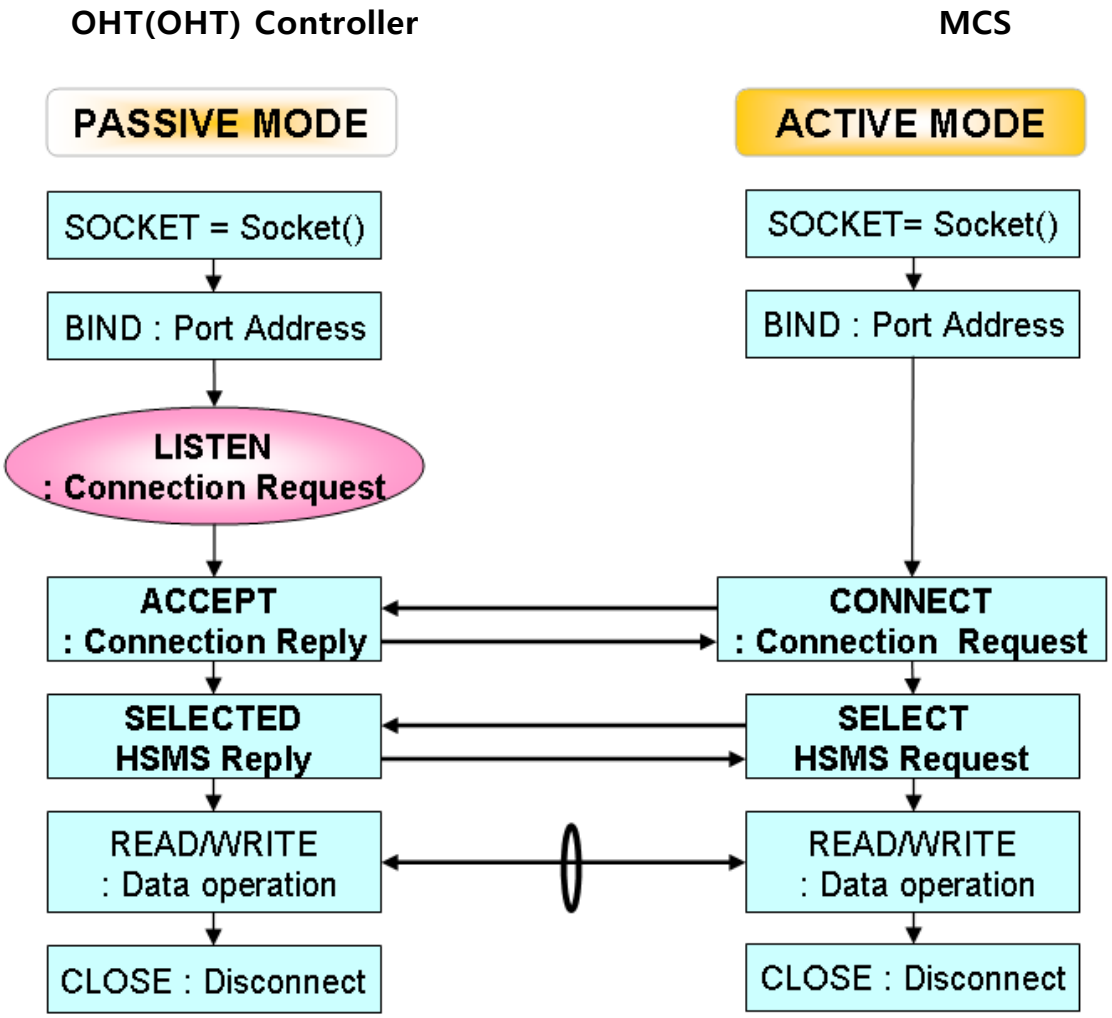
1.6 Connection Mode

Active Mode Entity : initiate TCP/IP Connection by sending Connection Request to Passive Mode Entity.

Passive Mode Entity : listen for an incoming connection request from Active mode Entity.



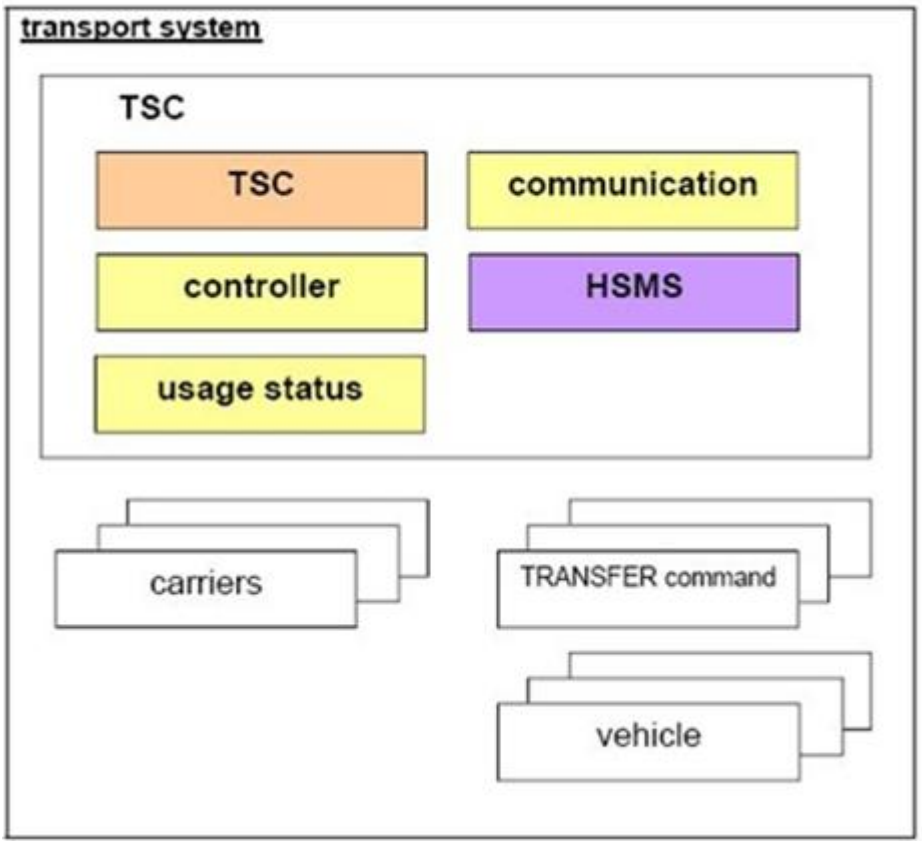
1.7 HSMS Communication Sequence



2 IB-SEM STATES MODEL

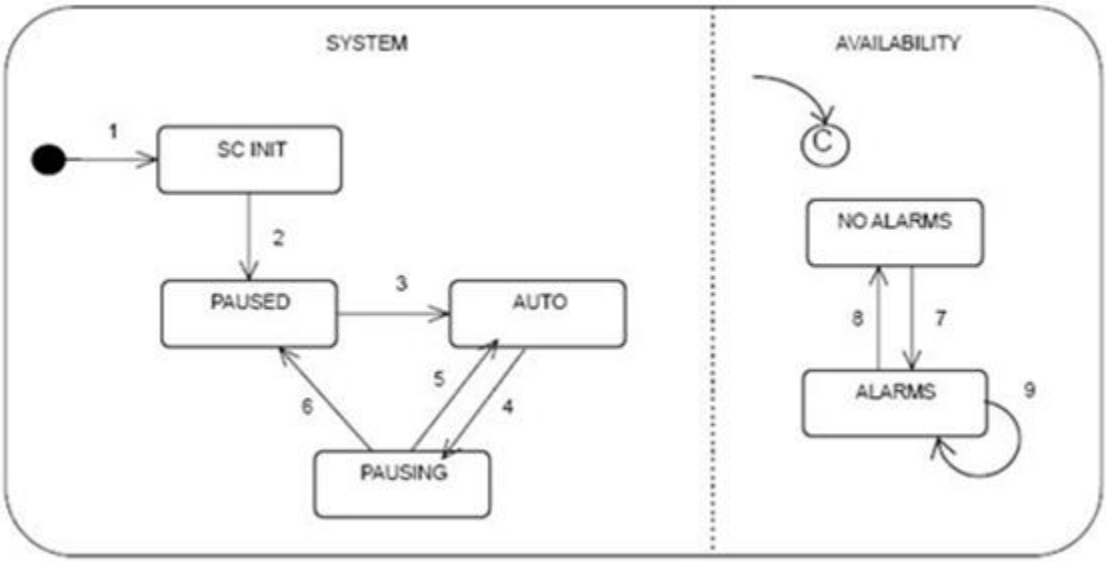
2.1 TSC State Model Entities

The following illustration indicates the entities contained in the state models listed on the previous page. For example, in the TSC State Model, the TSC is the entity in that model. Likewise, the in the case of the Carrier State Model, the carrier is the entity in that model. So, in the TSC State Model, there is only one entity, the TSC. However, in the Carrier State Model, there are as many entities as there are carriers. The following illustration indicates how things look from the host's perspective but the standard does not define whether or not this the actual condition.



2.2 TSC State Model

2.2.1 TSC State Model Diagram

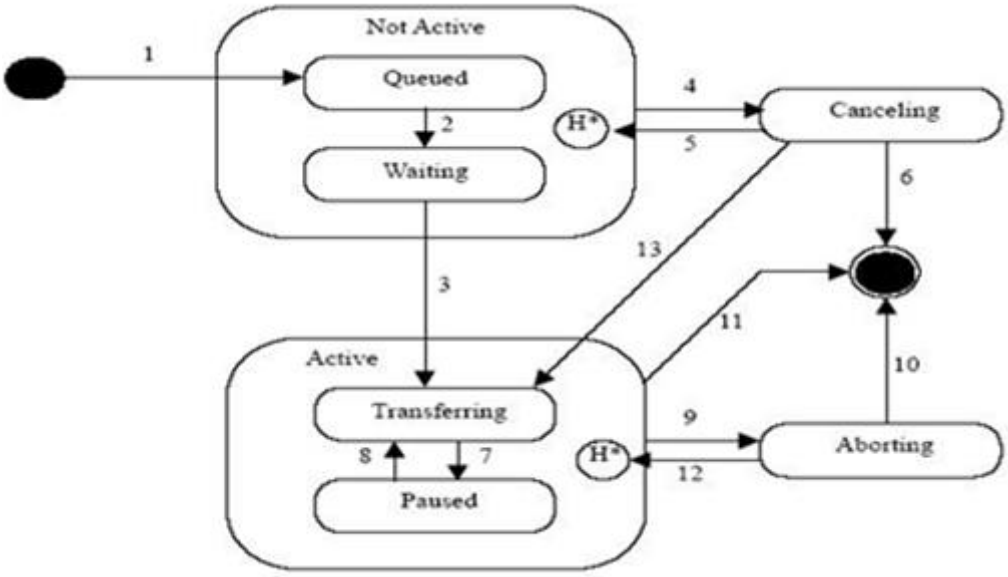


2.2.2 TSC State Transition Table

No.	Previous State	Trigger	New State	Actions	Comments
1	None	TSC Initiation	TSC Init	S6F11 TSCAutoInitiated	
2	TSC INIT	System started up successfully. All Cassette movement stopped	PAUSED	S6F11 TSCPaused	
3	PAUSED	RESUME command	AUTO	S6F11 TSCAutoCompleted	
4	AUTO	PAUSE command	PAUSING	S6F11 TSCPauseInitiated	
5	PAUSING	RESUME command	AUTO	S6F11 TSCAutoCompleted	
6	PAUSING	All Cassette movement has competed	PAUSED	S6F11 TSCPauseCompleted	
7	NO ALARMS	Alarm Set	ALARMS	S6F11 AlarmSet	
8	ALARMS	All Alarms cleared	NO ALARMS	S6F11 AlarmCleared	
9	ALARMS	Alarm Set	ALARMS	S6F11 AlarmSet	

2.3 Transfer Command State Model

2.3.1 Transfer Command State Model Diagram



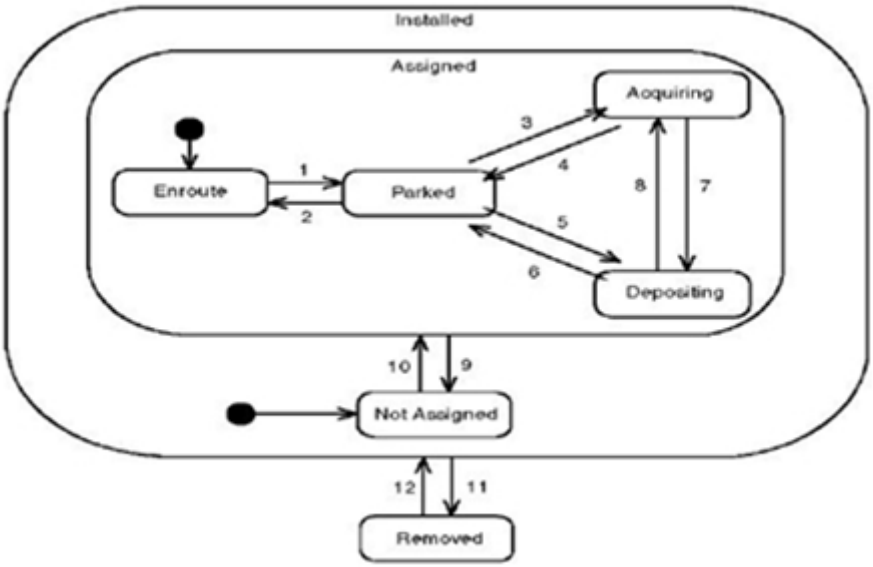
2.3.2 Transfer Command State Transition Table

No.	Previous State	Trigger	New State	Actions
1	None	The Host generated TRANSFER command is successfully acknowledge by the TSC	QUEUED	
2	QUEUED	The TRANSFER command has been initiated by the TSC	WAITING	S6F11 TransferInitiated
3	WAITING	The acquire of the first carrier of the transfer unit begins	TRANSFERRING	S6F11 Transferring
4	NOT ACTIVE	Host sends CANCEL command for a specified TRANSFER command to TSC	CANCELING	S6F11 TransferCancelInitiated
5	CANCELING	Transport system is unable to cancel the TRANSFER command	Previous NOT ACTIVE sub state	S6F11 TransferCancelFailed
6	CANCELING	The cancel procedure for the TRANSFER command has completed by the transport system and TSC	None	S6F11 TransferCancelCompleted
7	TRANSFERRING	The TSC resumes execution of the TRANSFER command due to an anomaly condition	PAUSED	S6F11 TransferPaused
8	PAUSED	The TSC resumes execution of the TRANSFER command since the anomaly condition has been cleared	TRANSFERRING	S6F11 TransferResumed
9	ACTIVE	Host initiates an abort of TRANSFER command	ABORTING	S6F11 TransferAbortInitiated
10	ABORTING	The abort procedure for the TRANSFER command has completed by the transport system and TSC	None	S6F11 TransferAbortCompleted
11	ACTIVE	The TRANSFER command has completed by the transport system and TSC (either successfully or	None	S6F11 TransferCompleted sent to Host with ResultCode ResultCode=0 : successful

		unsuccessfully)		nonzero : unsuccessful
12	ABORTING	Transport system is physically unable to abort the TRANSFER command	Previous ACTIVE substate	S6F11 TransferAbortfailed
13	CANCELING	Transport system is unable to cancel because the transfer is now ACTIVE	TRANSFERRING	S6F11 Transferring

2.4 Vehicle State Model

2.4.1 Vehicle State Model Diagram



2.4.2 Vehicle State Transition Table

No.	Previous State	Trigger	New State	Actions
1	ENROUTE	Vehicle arrives at a transfer port associated with an ACTIVE transfer command	PARKED	S6F11 VehicleArrived
2	PARKED	Vehicle departs a transfer port associated with an ACTIVE transfer command	ENROUTE	S6F11 VehicleDeparted
3	PARKED	The carrier handoff parallel I/O starts for the vehicle to acquire (load) the transfer unit	ACQUIRING	S6F11 VehicleAcquireStarted
4	ACQUIRING	The carrier handoff parallel I/O completes for the vehicle to acquire (unload) the transfer unit	PARKED	S6F11 VehicleAcquireComleted
5	PARKED	The carrier handoff parallel I/O starts for the vehicle deposit (unload) the transfer unit	DEPOSITING	S6F11 VehicleDepositStarted
6	DEPOSITING	The carrier handoff parallel I/O completes for the vehicle to deposit (unload) the transfer unit	PARKED	S6F11 VehicleDepositComleted
7	ACQUIRING	The carrier handoff parallel I/O completes for the vehicle to acquire (load) the transfer unit and starts for the vehicle to deposit (unload) the carrier	DEPOSITING	S6F11 VehicleDepositStarted
8	DEPOSITING	The carrier handoff parallel I/O completes for the vehicle to deposit	ACQUIRING	S6F11 VehicleAcquireStarted

		(unload) the transfer unit and starts for the vehicle to acquire (load) the carrier		
9	ASSIGNED	Vehicle is no longer being utilized for the specified command	NOT ASSIGNED	S6F11 VehicleUnassigned
10	NOT ASSIGNED	Vehicle is allocated to TRANSFER command	ASSIGNED	S6F11 VehicleAssigned
11	INSTALLED	Vehicle is removed from use of transfer commands	REMOVED	S6F11 VehicleRemoved
12	REMOVED	Vehicle is installed for use of transfer commands	INSTALLED	S6F11 VehicleInstalled

2.5 Carrier State Model

2.5.1 Carrier State Model Diagram

2.5.2 Carrier State Transition Table

No.	Previous State	Trigger	New State	Actions
1	None	A TSC database entry is created for the carrier	INSTALLED	S6F11 CarrierInstalled
2	INSTALLED	A TSC database entry is removed for the carrier	None	S6F11 CarrierRemoved

3 COLLECTION EVENT ID LIST

The transport system supports the event reports based on the "Dynamic Event Report Setting Modifications" included in GEM.

This chapter explains the type's events used by the transport system.

3.1 Collection Event List

This section identifies data collection events and defines (Stream 6) suggested associated variable data items. The host can use the report definition scenario defined in SEMI E30 to define reports at IBSEM defined levels. The intent is to demonstrate that certain suggested data is available at specific events.

CEID (1~) : Control State Transition Event

CEID (101~): TSC State Transition Event

CEID (201~): Transfer Command State Transition Event

CEID (301~): Carrier State Transition Event

CEID (401~): Port State Transition Event

CEID (501~): Non-Transition Event

CEID (601~): Vehicle State Transition Event

CEID (701~): Unit Alarm State Transition Events

3.2 TSC Control State Transition Events

CEID	EVENT NAME	FROM STATE	TO STATE	DVVALs	RPT ID
1	Offline	ONLINE	OFFLINE	EqpName	1
2	OnlineLocal	OFFLINE ONLINE-REMOTE	ONLINE-LOCAL	EqpName	1
3	OnlineRemote	OFFLINE ONLINE-LOCAL	ONLINE-REMOTE	EqpName	1

3.3 TSC State Transition Events

CEID	EVENT NAME	FROM STATE	TO STATE	DVVALs	RPT ID
101	AlarmCleared	ALARMS	NO ALARMS	CommandID VehicleInfo	2
102	AlarmSet	NO ALARMS ALARMS	ALARMS ALARMS	CommandID VehicleInfo	2
103	TSCAutoCompleted	PAUSED PAUSING	AUTO AUTO	EqpName	1
104	TSCAutoInitiated	None	TSC INIT	EqpName	1
105	TSCPauseCompleted	PAUSING	PAUSED	EqpName	1
106	TSCPaused	TSC INIT	PAUSED	EqpName	1
107	TSCPauseInitiated	AUTO	PAUSING	EqpName	1

3.4 TRANSFER Command State Transition Events

CEID	EVENT NAME	FROM STATE	TO STATE	DVVALs	RPT ID
201	TransferAbortCompleted	ABORTING	None	CommandID TransferCompleteInfo	3
202	TransferAbortFailed	ABORTING	ACTIVE (History)	CommandID	4
203	TransferAbortInitiated	ACTIVE	ABORTING	CommandID	4
204	TransferCancelCompleted	CANCELING	None	CommandID	4
205	TransferCancelFailed	CANCELING	NOT ACTIVE (History)	CommandID	4
206	TransferCancelInitiated	NOT ACTIVE	CANCELING	CommandID	4
207	TransferCompleted	ACTIVE	None	CommandInfo TransferCompleteInfo ResultCode	5
208	TransferInitiated	QUEUED	WAITING	CommandID	4
209	TransferPaused	TRANSFERRING	PAUSED	CommandID	4
210	TransferResumed	PAUSED	TRANSFERRING	CommandID	4
211	Transferring	WAITING CANCELING	TRANSFERRING TRANSFERRING	CommandID	4

3.5 Carrier State Transition Events

CEID	EVENT NAME	FROM STATE	TO STATE	DVVALs	RPT ID
301	CarrierInstalled	None	INSTALLED	VehicleID CarrierID CarrierLoc CommandID CarrierType	6
302	CarrierRemoved	INSTALLED	None	VehicleID CarrierID CarrierLoc CommandID CarrierType	6

3.6 Non-Transition Event

CEID	EVENT NAME	EVENT DESCRIPTION	DVVALs	RPT ID
501	OperatorInitiatedAction	The operator initiated an action from the Transport System Controller. The related State Transition Events defined in Table 6 shall be required after this "OperatorInitiatedAction" event	CommandID CommandType CarrierID SourcePort DestPort Priority CarrierType	8
502	VehiclePositionChanged	The vehicle position has changed.	VehicleID VehicleCurrentPosition ~~VehicleNextPosition~~	15
503	PriorityUpdateCompleted		CommandID Priority	14
504	PriorityUpdateFailed		CommandID Priority	14
505	VehiclePositionInfos	The vehicle position information.	VehiclePositions	17

3.7 Vehicle State Transition Events

CEID	EVENT NAME	FROM STATE	TO STATE	DVVALs	RPT ID
601	VehicleArrived	ENROUTE	PARKED	VehicleID TransferPort	9
602	VehicleAcquireStarted	PARKED DEPOSITING	ACQUIRING ACQUIRING	VehicleID TransferPort CarrierID	10
603	VehicleAcquireCompleted	ACQUIRING	PARKED	VehicleID TransferPort CarrierID	10
604	VehicleAssigned	NOT ASSIGNED	ASSIGNED	VehicleID CommandID	11
605	VehicleDeparted	PARKED	ENROUTE	VehicleID TransferPort	9
606	VehicleDepositStarted	PARKED ACQUIRING	DEPOSITING DEPOSITING	VehicleID TransferPort CarrierID	10
607	VehicleDepositCompleted	DEPOSITING	PARKED	VehicleID TransferPort CarrierID	10
608	VehicleInstalled	REMOVED	INSTALLED	VehicleID	12
609	VehicleRemoved	INSTALLED	REMOVED	VehicleID	12
610	VehicleUnassigned	ASSIGNED	NOT ASSIGNED	VehicleID	11

				CommandID	
611	VehicleStatusChanged	IDLE DOWN	DOWN IDLE	VehicleID VehicleStatus	16

3.8 Unit Alarm State Transition Events

CEID	EVENT NAME	FROM STATE	TO STATE	DVVALs	RPT ID
701	UnitAlarmCleared	ALARM	NO ALARM	UnitiD AlarmID AlarmText	13
702	UnitAlarmSet	NO ALARM	ALARM	UnitiD AlarmID AlarmText	13

4 REPORT ID EVENT LIST

The following chart reveals the report format (default) the host uses in regards to the transport system as an example of a dynamic event report.

4.1 Transfer System Event Report

REPORT ID	VARIABLE	FORMAT
1	EqpName	1. <A EqpName>
2	CommandID VehicleInfo	1. <A CommandID> 2. <L[2] 1. <A VehicleID> 2. <U2 VehicleState> >
3	CommandID TransferCompleteInfo	1. <A CommandID> 2. <L[1] 1. <L[2] 1. <L[3] 1. <A CarrierID> 2. <A SourcePort> 3. <A DestPort> > 2. <A CarrierLoc> > >
4	CommandID	1. <A CommandID>
5	CommandInfo TransferCompleteInfo ResultCode	1. <L[2] 1. <A CommandID> 2. <U2 Priority> > 2. <L[1] 1. <L[2] 1. <L[3] 1. <A CarrierID> 2. <A SourcePort> 3. <A DestPort> > 2. <A CarrierLoc> > > 3. <U2 ResultCode>

6	VehicleID CarrierID CarrierLoc CommandID CarrierType	1. <A VehicleID> 2. <A CarrierID> 3. <A CarrierLoc> 4. <A CommandID> 5. <U2 CarrierType>
~~7~~	~~PortID~~	~~1. <A PortID>~~
8	CommandID CommandType CarrierID SourcePort DestPort Priority CarrierType	1. <A CommandID> 2. <A CommandType> 3. <A CarrierID> 4. <A SourcePort> 5. <A DestPort> 6. <U2 Priority> 7. <U2 CarrierType>
9	VehicleID TransferPort	1. <A VehicleID> 2. <A TransferPort>
10	VehicleID TransferPort CarrierID	1. <A VehicleID> 2. <A TransferPort> 3. <A CarrierID>
11	VehicleID CommandID	1. <A VehicleID> 2. <A CommandID>
12	VehicleID	1. <A VehicleID>
13	UnitID AlarmID AlarmText	1. <A UnitID> 2. <U4 AlarmID> 3. <A AlarmText>
14	CommandID Priority	1. <A CommandID> 2. <U2 Priority>
15	VehicleID VehicleCurrentPosition	1. <A VehicleID> 2. <A VehicleCurrentPosition>
16	VehicleID VehicleStatus	1. <A VehicleID> 2. <U2 VehicleStatus>
17	VehiclePositions	1. <L[n] 1. <L[2] 1. <A VehicleID> 2. < A VehicleCurrentPosition> > .... n. <L[2] 1. <A VehicleID> 2. <A VehicleCurrentPosition> > >

5 Data Item Dictionary

5.1 SECS Data Item Dictionary

This chapter explains the SECS message data items used by the transport system.

5.1.1 SECS Data Items

The following chart contains the SECS message data items used by the transport system. The features of the chart are as follows:

NAME : The name of the data item.

FORMAT : The format of the data item value. (However, "Ux" is sent as "U2" from the host)

SIZE : The size of the data item value.

EXPLANATION : An explanation of the data item and/or the range of the data.

5.1.2 SECS Data Items Table

NAME	FORMAT	SIZE	EXPLANATION
ACKC5	B	1	■ 0 = ACK ■ >0 = Error, Could not ACK ■ 1-63 = Hold
ACKC6	B	1	■ 0 = ACK ■ >0 = Error, Could not ACK ■ 1-63 = Hold
ACKC10	B	1	■ 0 = ACK ■ 1 = Message not displayed ■ 2-63 = Hold
ALCD	B	1	■ bit 8 = 1 Generated alarm status ■ bit 8 = 0 Clear alarm status ■ bit 1~7 = 0 Not used ■ bit 1~7 = 1 Personal safety ■ bit 1~7 = 2 Equipment safety ■ bit 1~7 = 3 Parameter control warning ■ bit 1~7 = 4 Parameter control error ■ bit 1~7 = 5 Irrecoverable error ■ bit 1~7 = 6 Equipment status warning ■ bit 1~7 = 7 Attention flags ■ bit 1~7 = 8 Data integrity ■ bit 1~7 = 9 Other categories
ALED	B	1	■ bit 8 = 1 Alarm enabled ■ bit 8 = 0 Alarm disabled
ALID	U4	1	■ Alarm ID

ALTX	A	Max : 40	■ Alarm text
CEED	BOOLEAN	1	■ FALSE = not valid ■ TRUE = valid
CEID	U2	2	■ Collection event ID
CEPACK	L, U1		■ 0 = No error ■ 1 = CPNAME doesn't exist ■ 2 = the incorrect value is specified in CEPVAL ■ 3 = the incorrect format is specified in CEPVAL ■ 4 = the CPNAME usage isn't valid
CPVAL	A, B, BOOLEAN, Fx, Ix, J, Ux		■ the command extension parameter value
COMMACK	B	1	■ 0 = ACK ■ 1 = Denied, Try Again ■ 2-63 = Hold
CPACK	B	1	■ 0 = No error ■ 1 = CPNAME doesn't exist ■ 2 = the incorrect value is specified in CPVAL ■ 3 = the incorrect format is specified in CPVAL ■ >3 = Another equipment error ■ 4-63 = Hold
CPNAME	A	Max : 40	■ Command parameter name
CPVAL	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Command parameter value
DATAID	U4	4	■ Data ID ■ Always sends DATAID = 0
DRACK	B	1	■ 0 = ACK ■ 1 = Denied. Insufficient space ■ 2 = Denied. Invalid format ■ 3 = Denied. At least one RPTID is already defined ■ 4 = Denied. At least VID is already defined ■ >4 = Some other error. ■ 5-63 = Hold
EAC	B	1	■ 0 = ACK ■ 1 = Denied, there isn't at least one constant ■ 2 = Denied, Busy ■ 3 = Denied, At least constant is beyond the allowed range ■ >3 = Some other error ■ 4-63 = Hold
ECDEF	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Equipment constant default value
ECID	U2		■ Equipment constant ID
ECMAX	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Equipment constant maximum value
ECMIN	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Equipment constant minimum value
ECNAME	A		■ Equipment constant name

ECV	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Equipment constant
ERACK	B	1	■ 0 = ACK ■ 1 = Denied. there isn't at least one CEID ■ >1 = Some other error ■ 2-63 = Hold
HCACK	B	1	■ 0 = Confirmed, the command was executed (The transfer system doesn't use this value, Confirmation is made using the number 4 value) ■ 1 = Command does not exist ■ 2 = Currently not able to execute ■ 3 = At least one parameter is invalid ■ 4 = Confirmed, the command will be executed and completion will be notified by an event ■ 5 = Rejected, Already requested ■ 6 = Object doesn't exist ■ 7 = Undefined RCMD ■ 8 = ControlState is not Online ■ 9 = Unmatch CarrierType ■ 31 = Undefined Source ■ 32 = Undefined Dest ■ 52 = Rejected, Already requested(CommandID) ■ 53 = Rejected, Already requested(CarrierID)
LRACK	B	1	■ 0 = ACK ■ 1 = Denied. Insufficient space ■ 2 = Denied. Invalid format ■ 3 = Denied. At least one CEID link is already defined ■ 4 = Denied. there isn't at least one CEID ■ 5 = Denied. there isn't at least one RPTID ■ >5 = Some other error ■ 6-63 = Hold
MDLN	A	Max : 6	■ Equipment format
MEXP	A		■ SxxFyy
MHEAD	B		Message header of the message that is in error
OBJSPEC	A		■ The text string used to indicate the specified object instance ■ The emulator always sends OJSPEC = NULL
OFLACK	B		■ 0 = Offline Confirmed ■ 1-63 = Hold
ONLACK	B		■ 0 = ON_LINE REMOTE Confirmed ■ 1 = ON_LINE REMOTE Not Allowed ■ 2 = Equipment Already ON_LINE REMOTE ■ 3-63 = Hold
RCMD	A		■ Remote command or command sequence 'PAUSE', 'RESUME', 'CANCEL', 'ABORT'
RPTID	U2	2	■ Report ID
SHEAD	B	1	■ Message headers related to the transaction timer
SOFTREV	A	Max : 6	■ Software revision code

SV	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Status variable data
SVID	U2	2	■ Status variable ID
SVNAME	A		■ Status variable name
TEXT	A		■ One line of text
TIACK	B	1	Time confirmation code ■ 0 = OK ■ 1 = Error, Not OK ■ 2-63 = Hold
TID	B	1	■ 0 = Single or main terminal ■ >0 = Additional terminal of the same equipment
TIME	A	16	■ YYYYMMDDhhmmsscc
UNITS	A		■ Those allowed by section 9 of SEMI E5
V	A, B, BOOLEAN, Fx, Ix, J, Ux		■ Variable data
VID	U2	2	■ Variable ID

5.1.3 Variable Data Items Dictionary

This section explains the transport system variables and VIDs. Values of these variables will be available to the host via collection event reports and host status queries.

Equipment Constants (ECV): The value can be changed by the host using S2F15. The operator may have the ability to change some or all of the values. The value of an equipment constant may be queried at any time by the host using the S2F13/14 transaction or Stream 6 reports.

Status Variables (SV): The values are valid at all times. A SV may not be changed by the host or operator, but may be changed by the equipment. A host or operator command may change an equipment status thus changing a SV. The value of status variables may be queried by the host at any time using the S1F3/4 or Stream 6 reports.

Data Variables (DVVAL): These are variables which are valid upon the occurrence of a specific collection event, and may or may not be valid at other times depending upon the equipment. An attempt to read a variable data item when it's invalid will not result in an error, but the data reported may not have relevant meaning.

Variable Data (V): This is a class of variable data which includes all the previously defined types of variables.

5.1.4 Variable Data Items

The features of the chart are as follows:

VID : ID of the variable

VARIABLE NAME : A unique name for the variable data item.

CLASS : The data type of the item.

FORMAT : <SECS Message Language (SML) mnemonic>acceptable formats are SEMI E5 lists, ASCII, floating point, unsigned integer or signed integer. A description of .ANY., indicates that only the above formats are acceptable and is left to the supplier to decide.

EXPLANATION : Any additional information pertinent to the variable name.

5.1.5 Variable Data Items Table

VID	VARIABLE NAME	CLASS	FORMAT	DESCRIPTION	COMMENTS
1	AlarmID	DVVAL	Ux	Alarm ID	
-	AlarmIDi	SV	Ux		
4	AlarmText	DVVAL	A[1-64]	Alarm Text	
-	AlarmTexti	SV	A[1-64]	Alarm Text	
6	CarrierID	DVVAL	A[1-64]	ID of the carrier being moved. CarrierID must be unique for each carrier within the TSC.	
-	CarrierIDi	SV	A[1-64]	ID of the ith carrier.	
8	CarrierIDList	DVVAL	L,n 1.<CarrierID1> . . n.<CarrierIDn>	The Ids of the Carriers being moved.	
9	CarrierLoc	DVVAL	A[1-64]	Unique location of the carrier within ITS as reported by the TSC.	
-	CarrierLoci	SV	A[1-64]	Unique location of the ith carrier within ITS as reported by the TSC.	
11	CommandID	DVVAL	A[1-64]	Remote Command ID Command ID generated by TSC.	
-	CommandIDi	SV	A[1-64]	The ith Remote Command ID The Ith Command ID generated by TSC.	
13	CommandInfo	DVVAL	L,2 1. <CommandID> 2. <Priority>	Command information associated with a particular transfer command.	
-	CommandInfoi	SV	L,2 1. <CommandIDi> 2. <Priorityi>	Command information associated with the ith transfer command.	

15	CommandName	DVVAL	A[1-20]	Host command issued to controller.	
16	CommandType	DVVAL	A[1-20]	The type of Command being initiated.	Valid Values are "TRANSFER', 'CANCEL', 'ABORT'
17	ControlState	SV	U2	Control State	1=offline/equipment offline 2=offline/going to offline 3=offline/host offline 4=online/local 5=online/remote
~~18~~	~~CurrentPortStates~~	~~SV~~	~~L,n 1. <PortInfo1> . . n. <PortInfon>~~	~~Current State of all the ports.~~	
19	DestPort	DVVAL	A[1-64]	Destination port unique identifier.	
-	DestPorti	SV	A[1-64]	The ith Destination port unique identifier.	
21	EnhancedCarriers	SV	L,n 1. <EnhancedCarrierInfo1> . . n. <EnhancedCarrierInfon>	List Current status of all carrier information in the TSC database. This includes all carriers for which there are Transfer commands.	
22	EnhancedCarrierInfoi	SV	L,4 1. <CarrierIDi> 2. <VehicleIDi> 3. <CarrierLoci> 4. <InstallTimei> 5. <CarrierTypei>	All database information associated with a particular carrier.	
23	EnhancedTransfers	SV	L,n 1. <EnhancedTransferCommand1> . . n.<EnhancedTransferCommandn>	List current status of ALL transfer commands	
24	EnhancedTransfercommandi	SV	L,3 1. <CommandInfoi> 2. <TransferStatei> 3. L,n 1. <TransferInfo1> . n. <TransferInfon>	Information associated with a particular Transfer command.	
25	EnhancedVehicles	SV	L,n 1.	List current status of all vehicles available or being	

			<EnhancedVehicleInfo> . . n.<EnhancedVehicleInfon>	used for TRANSFER commands.	
26	EnhancedVehicleInfoi	SV	L,3 1. <VehicleID> 2. <VehicleState>	Information associated with a particular vehicle.	
27	InstallTimei	SV	TIME (A16)	Time the carrier was created in the TSC database.	yyyymmddhhmmsscc
28	~~PortID~~	~~DVVAL~~	~~A[1–64]~~	~~ID of the port.~~	
-	~~PortIDi~~	~~SV~~	~~A[1–64]~~	~~ID of the port.~~	
30	~~PortInfoi~~	~~SV~~	~~L,2~~ ~~1. <PortIDi>~~ ~~2. <PortTransferStatei>~~	~~Port information associated with a particular port.~~	
31	~~PortTransferStatei~~	~~SV~~	~~U2~~	~~Port Transfer State.~~	~~1 OutOfService~~ ~~2 InService~~
32	Priority	DVVAL	U2	Remote command priority.	0 is not valid 1 is the LOWEST priority, 99 is the highest priority
-	Priorityi	SV	U2	The ith Remote command priority.	0 is not valid 1 is the LOWEST priority, 99 is the highest priority
34	ResultCode	DVVAL	U2 Successful = 0 Unsuccessful ≠ 0 ResultCodes that must be implemented are: Canceled Aborted	Result Code of a transport system command. Associated with the command completion event.	0 : Successful 1 : Unsuccessful 5 : Source Interlock Error 6 : Dest Interlock Error 7 : Empty Carrier 8 : Double Storage
35	SourcePort	DVVAL	A[1–64]	Source port unique identifier.	
-	SourcePorti	SV	A[1–64]	The ith Source port unique identifier.	
37	SpecVersion	SV	A[0–20]	Version of SEMI E82 to which the equipment is compliant.	
38	TransferCommand	DVVAL	L,n 1. <CommandInfo> 2. <TransferInfo1> . .. n. <TransferInfom>	Information associated with a particular TRANSFER command.	
-	TransferCommandi	SV	L,2 1. <CommandInfoi> 2. L, m	Information associated with the ith TRANSFER command.	

			1. <TransferInfo1> . .. m. <TransferInfom>		
40	TransferCompleteInfo	DVVAL	L,n 1.<L,2 1. <TransferInfo1> 2. <CarrierLoc1 #1> : : n.<L,2> 1. <TransferInfon> 2. <CarrierLocn #1>	Carrier information associated with a transfer.	
41	TransferInfo	DVVAL	L,3 1. <CarrierID> 2. <SourcePort> 3. <DestPort>	Carrier information associated with a particular transfer command.	
-	TransferInfoi	SV	L,3 1. <CarrierIDi> 2. <SourcePorti> 3. <DestPorti>	Carrier information associated with the ith transfer command.	
43	TransferPort	DVVAL	A[1–64]	Transfer Port unique identifier.	
44	TransferPortList	DVVAL	L,n 1. <TransferPort1> 2. <TransferPort2> . . . n. <TransferPortn>	Transfer Port information associated with a particular vehicle arrival or departure event.	
45	TransferStatei	SV	U2	State of Transfer Command.	1. Queued 2. Transferring 3. Paused 4. Canceling 5. Aborting 6. Waiting
46	TSCState	SV	U2	TSC State (SYSTEM).	1 = TSC Init 2 = Paused 3 = Auto 4 = Pausing
47	UnitID	DVVAL	A[1–64]	The Id of the 'transport unit'.	
-	UnitIDi	SV	A[1–64]	The Id of the 'transport unit'.	
49	VehicleID	DVVAL	A[1–32]	Unique identification of a	

				vehicle associated with an event.	
-	VehicleIDi	SV	A[1–32]	Unique identification of the vehicle.	
51	VehicleInfo	DVVAL	L,2 1. <VehicleID> 2. <VehicleState>	Information associated with a particular vehicle.	
52	VehicleState	DVVAL	U2	The state of the vehicle.	1 = Removed 2 = Not Assigned 3 = Enroute 4 = Parked 5 = Acquiring 6 = Depositing
54	VehicleStatus	DVVAL	U2	The Status of the vehicle	1= Idle 2 = Down
56	EqpName	ECV	A[1-32]	Unique ID of the TSC	
57	VehicleCurrentPosition	SV	A[1-10]	Current position of vehicle	
58	VehicleNextPosition	SV	A[1-10]	Next position of vehicle	
60	CarrierType	DVVAL	U2	Type of the Carrier	1 = CAN 2 = CAPASSY 3 = INSULATOR 4 = TERMINAL 5= ,6= ,7=OTHER
61	EnhanedUnitAlarms	SV	L,n 1. <EnhancedUnitAlarmsInfo 1> . . n. < EnhancedUnitAlarmsInfo n>		
62	EnhancedUnitAlarmsInfoi	SV	L,3 1. <UnitID> 2. <AlarmID> 3. <AlarmText>		
63	EMPTYFLAG	DVVAL	U2	Type of the EmptyFlag	0. = EMPTY 1. = FULL
96	LotID	DVVAL	A[1-64]	ID of Lot	
100	BatchID	DVVAL	A[1-64]	ID of BatchID	
101	ProcessID	DVVAL	A[1-64]	ID of ProcessID	
102	CARRIERSTACKINFO	DVVAL	L ,n 1. < CarrierIdi > ..... n. < CarrierIdn>	Information stacked with carrierid list	

103	Quantity	SV	U2	Quantity	Count
104	VehiclePositionInfo	DVVAL	L ,2 1. <A VehicleID> 2. < A VehicleCurrentPosition>	Current positional information of vehicle	
105	VehiclePositions	DVVAL	L,n 1. < VehiclePositionInfo 1> . n. < VehiclePositionInfo n>	Current positional information of vehicles	