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KIGEM
Automation Software

Reference Manual

KIGEM-901-01 Rev. B / September 2019

KIGEM-901-01B

KEITHLEY
A Tektronix Company

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Cleveland, Ohio, U.S.A.

These are the original instructions in English.

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Software safety precautions

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Before using this product, see the safety precautions associated with your instrument. The instrument associated with this software is intended for use by personnel who recognize shock hazards and are familiar with the instrument safety precautions to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using any instrument.

Refer to your instrument's user documentation for complete product specifications. If the product is used in a manner not specified, the protection provided by the product warranty may be impaired.

Safety precaution revision as of January 2018.

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Section 1

Industry standards

In this section:

Introduction

KIGEM is implemented using a ConX300 driver that complies with the following SEMI standards.

NOTE

This software and equipment generally comply with the I300I/J300 Global Joint Guidance for CIM for 300mm semiconductor factories, Revision 5 (April 2000).

Standard	**KIGEM version** **5.7.2a** **5.7.2b**	**Description**
SEMI E5	0813	SEMI Equipment Communications Standard 2 Message Content (SECS II)
SEMI E30	0416	Generic Model for Communications and Control of Manufacturing Equipment (GEM)
SEMI E37	0413	High-Speed SECS Message Services (HSMS) Generic Services
SEMI E37.1	0702 (0413)	High-Speed SECS Message Service Single Selected-Session Mode (HSMS-SS or HSMS-SSS)
SEMI E39	0703 (0614)	Object Services Standard: Concepts, Behavior and Services
SEMI E39.1	0703	SECS-II Protocol for Object Services Standard (OSS)
SEMI E40	0813	Standard for Processing Management
SEMI E40.1	0813	SECS-II Support for Processing Management Standard
SEMI E87	0312	Carrier Management System (CMS)

Standard	KIGEM version 5.7.2a 5.7.2b	Description
SEMI E87.1	0707	Provisional Specification for SECS-II Protocol for Carrier Management (CMS)
SEMI E90	0312	Substrate tracking
SEMI E90.1	0312	Specification for SECS-II Protocol Substrate Tracking
SEMI E94	0314	Control Job Management
SEMI E94.1	0312	SECS-II Protocol for Control Job Management (CJM)
SEMI E116	0707	Equipment Performance Tracking
SEMI E116.1	0707	SECS-II Protocol for Equipment Performance Tracking (EPT)

This software/equipment generally complies with SEMI standards. However, some of these SEMI standards contain technical errors, and Keithley has made reasonable assumptions to correct these errors.

KIGEM integrates with hardware systems compliant with SEMI Standard E84 (Enhanced Carrier Handoff Parallel I/O Interface) to provide an interface between production equipment and Automated Material Handling Systems. Please refer to Semiconductor Equipment Materials International for the most up to date publications of SEMI Standards at www.semi.org.

NOTE

Final compliance of Keithley S530 Series testers, with some of these SEMI standards, depends on the level of automation support implemented on the wafer prober. Keithley continuously works with the major prober vendors to understand their implementation status and progress.

Note about source materials and other reference documents

Some of the content in this manual is borrowed from the I300I/J300 CIM Global Joint Guidance for 300mm Semiconductor Factories standards and ConX300 documentation, which is a trademark of PEER Intellectual Property, Inc.

In addition to this manual, you will also need the following Keithley manuals:

- KIGEM Automation Software User's Manual (document number KIGEM-900-01)
- KIGEM Automation Software Release Notes (document number KIGEM-910-01)

For more information on other KTE components and building user libraries, refer to:

- S530 Parametric Test System Reference Manual (document number S530-901-01)
- Keithley Test Environment (KTE) Programmer's Manual (document number S500-904-01)

Information in this manual has also been derived from the following SEMI standards documents.

You should also be familiar with:

- SEMI E4 SEMI Equipment Communications Standard 1 Message Transfer (SECS-I)
- SEMI E5 SEMI Equipment Communications Standard 2 Message Content (SECS-II)
- SEMI E30 Generic Model for Communications and Control of SEMI Equipment (GEM)
- SEMI E37 High-Speed SECS Message Services (HSMS) Generic Services
- SEMI E37.1 High-Speed SECS Message Services Single-Session Mode (HSMS-SS)
- SEMI E39 and E39.1 Object Services
- SEMI E40 and E40.1 Processing Management
- SEMI E84 Enhanced Carrier Handoff Parallel I/O Interface
- SEMI E87 and E87.1 Carrier Management
- SEMI E90 and E90.1 Substrate Tracking
- SEMI E94 and E94.1 Control Job Management
- SEMI E95 Human Interface for Semiconductor Manufacturing Equipment

SEMI E87 Carrier Management Standard Compliance

The following table shows SEMI E87 Carrier Management Compliance.

SEMI E87 0312 Compliance Statement Section 21.1*			
Fundamental CMS Requirements	**CMS Section**	**Implemented**	**CMS Compliant**
Load Port Numbering	9.2	YES	YES
Carrier Slot Numbering	9.3	YES	YES
Load Port Transfer State Model	9.5, 9.5.4	YES	YES
Carrier Object Implementation	10	YES	YES
Load Port Reservation State Model	12	NO**	NO**
Load Port/Carrier Association State Model	13	YES	YES
CarrierID Verification Support	14.2	YES	YES
Slot Map Verification Support	14.3	YES	YES
Services Implementation	16	YES	YES
Additional Events Implementation	18	YES	YES
Variable Data Definitions	19	YES	YES
Alarms Implementation	20	YES	NO**

Additional CMS Capabilities	**CMS Section**	**Implemented**	**CMS Compliant**
Load Port Reservation State Model (fixed buffer Equipment)	12	YES	YES
Reservation Visible Signal	12.2	YES	YES

* This software/equipment complies with E87 for fixed buffer equipment. It does not support E87 internal buffer equipment, nor equipment which loads or unloads single wafers not in carriers.
**This equipment relays prober Alarms through CEID 5550 and 5551.

NOTE

Final compliance of Keithley S530 Series testers with, some of these SEMI standards, depends on the level of automation support implemented on the wafer prober. Keithley Instruments continuously works with the major prober vendors to understand their implementation status and progress.

SEMI E90 Substrate Tracking Standard Compliance

The following table shows SEMI E90 Substrate Management Compliance.

This software and equipment supports E90 Single Substrate Tracking. It does not support E90 Substrate Group Tracking.

This software and equipment supports E90 only for substrates which are loaded from carriers. It does not support E90 for single substrates not loaded from carriers.

SEMI E90-0312 Compliance Statement Section 13			
Fundamental STS Requirements	**STS Section**	**Implemented**	**STS Compliant**
Substrate Tracking	8 (except 8.4)	YES	YES
Substrate Object and State Model	9	YES	YES
Substrate Location Object and State Model	10	YES	YES
Service Message Implementation (except host-initiated Register(Create) Substrate and Remove Substrate)	12	YES	YES
Variable Data	13	YES	YES
Events	8.4	YES	YES

Additional STS Capabilities	**STS Section**	**Implemented**	**STS Compliant**
Host-Initiated Register (Create Substrate)	12.1.1	NO	NO
Host-Initiated Remove Substrate		NO	NO
Batch Location Object and State Model	11	NO	NO
UpdateSubstrateObject service	12	NO	NO
Substrate Reading Status	9.3	NO	NO
SubstIDStatus substrate object attribute	9.5	NO	NO
ProceedWithSubstrate service	12.2	NO	NO
CancelSubstrate service	12.2	NO	NO
Additional Events	14	NO	NO

NOTE

Final compliance of Keithley S530 Series testers with some of these SEMI standards depends on the level of automation support implemented on the wafer prober. Keithley Instruments continuously works with the major prober vendors to understand their implementation status and progress.

SEMI E40 Process Management Compliance

The following table shows SEMI E40 Process Management Compliance.

SEMI E40-0813 Compliance Statement Section 12			
Fundamental PM Requirements	**PM Section**	**Implemented**	**PM Compliant**
Single Process Job Execution	8.2	YES	YES
Process Job Failure Indication	8.2.1.7	YES	YES
Abort Command	8.2.3.2	YES	YES
Process Job Object Implementation	8.3, 9	YES	YES
Reject Invalid/Incomplete Parameters	8.2.1.2.1	YES	YES
Reject Unsupported Capabilities	11.2	YES	YES
Services Implementation (not per Additional)	10	PARTIAL*	

* This software/equipment does not support these services:
S16F23 `SetRecipeVariable` - Recipe Variables must be specified when PRJob is created.
S16F25 `SetStartMethod` - Start Method must be specified when PRJob is created.

Additional PM Capabilities	**PM Section**	**Implemented**	**PM Compliant**
Process Job Milestones	8.2.1 except 8.2.1.2, 3	YES*	YES
Resource Pre/Post-conditioning		YES	YES
Stop, Pause and Resume Commands	8.2.3.3, 4, 5	YES	YES
Manual Process Start	8.2.3.9	YES	YES
Process Job Queuing	8.3	NO**	
Process Tuning	7.5, 10.4.9	YES	YES
Processing of Material Groups	7.6	YES	YES
Multiple Concurrent Process Jobs	7.7	YES	YES
Multiple Consecutive Process Jobs	7.8	YES	YES
Process Jobs with No Material	7.9	YES	YES
Event Notification	8.2.2	YES	YES
Enhanced Job Creation	10.4.2	YES	YES
Multiple Job Creation	10.4.3	YES	YES

* Implemented using E30-style event reports.
** As required by SEMI E94 Control Job Management, this software and equipment pools Process Jobs and does not queue them.

SEMI E94 Control Job Management Compliance

The following table shows SEMI E94 Control Job Management Compliance.

SEMI E94-0314 Compliance Statement Section 15.2			
Fundamental CJM requirements	**CJM Section**	**Implemented**	**CJM Compliant**
Control Job Object	8	YES	YES
Control Job State Model	9	YES	YES
Control Job Queue Model	10	YES	YES
Carrier Properties	11	YES	YES
Service Message Implementation	12	YES	YES
Variable Data	13	YES	YES
Events	7.3.2	YES	YES
Additional Requirements	14	YES	YES

Additional CJM Capabilities	**CJM Section**	**Implemented**	**CJM Compliant**
Material Redirection Mode	8.4.5.3	NO*	NO
Incomplete MtrlOutSpec	8.4.5.3.6	NO*	NO

* For this equipment, the source location and the destination location are the same.

SEMI E116 Equipment Performance Tracking

The following table shows SEMI E116 Equipment Performance Tracking.

NOTE

To implement E116, the prober must also support E116.

SEMI E116-0707 Compliance Statement Section 12			
Fundamental EPT requirements	EPT Section	Implemented	EPT Compliant
EPT State Model for Equipment	9	YES	YES
EPT State model for each EPT module	9	YES	YES
EPTTRacker Objects	10	YES	YES
EPT Events	10	YES	YES

SEMI E30 GEM Compliance

The following table shows SEMI E30-0416 Compliance Statement Section 11.

SEMI E30-0416 Compliance Statement Section 11	Implemented	GEM-compliant
Fundamental GEM requirements	Implemented	GEM Compliant
State Models	YES	YES
Equipment Processing States	YES	YES
Host-Initiated S1, F13/14 Scenario	YES	YES
Event Notification	YES	YES
On-Line Identification	YES	YES
Error Messages	YES	YES
Documentation	YES	YES
Control (Operator Initiated)	YES	YES

Additional Capabilities	Implemented	GEM Compliant
Establish Communications	YES	YES
Dynamic Event Report Configuration	YES	YES
Data Variable and Collection Event Namelist Request	YES	YES
Variable Data Collection	YES	YES
Trace Data Collection	YES	YES
Status Data Collection	YES	YES
Alarm Management	YES	YES
Remote Control	YES	YES
Equipment Constants	YES	YES
Process Program Management	YES	Process Programs: NO E42 Recipes: NO E139 Recipes: NO
Material Movement	YES	YES
Equipment Terminal Services	YES	YES
Clock	YES	YES
Limits Monitoring	NO	NO
Spooling	YES	YES
Control (Host-initiated)	YES	YES

NOTE

Implemented capabilities are marked as non-GEM compliant only because not all scenarios within capability are implemented. The implemented scenarios within those capabilities meet the GEM specifications. Refer to the corresponding software release notes for known limitations on a release.

Only an unformatted process program is supported by the equipment.

Section 2

Object dictionary

In this section:

Introduction

This section describes the E39 Objects that exist in this equipment. The host can access these Objects using E39 Object Services (Stream 14) messages.

The following are the column heading definitions used in this section.

- #: A sequential line item number.
- **Attribute name**: The name of Object attribute.
- **Format**: SML Item Format Mnemonic. Types include list (L), binary (B), boolean (BOOLEAN), ASCII (A), 4-byte signed integer (I4), 1-byte unsigned integer (U1), 2-byte unsigned integer (U2), and 4-byte unsigned integer (U4).
- **Access**: Read-only (RO) or read and write (RW)
- **Description**: The full variable name, an explanation of the purpose of the variable, an example of the code format used for the variable, if applicable, and any object values and their definitions.

E39 Carrier Location Object

The following table shows the attributes and descriptions for the E39 Carrier Location Object.

#	Attribute Name	Format	Access	Description
1	ObjType	A	RO	CarrierLoc
2	ObjID	A	RO	LocationID The carrier location ID for the carrier location event.
3	PartitionID	A	RO	The partition to which the given location belongs.

E39 Carrier Object

The following table shows the attributes and descriptions for the E39 Carrier Object.

#	Attribute name	Format	Access	Description
1	ObjType	A	RO	Carrier
2	ObjID	A [1..80]	RO	Carrier ID. This must consist of ASCII characters from 0x20 through 0x7E and cannot include the characters ?, *, ~, >, or :. Upper and lowercase alphabetic characters are considered equivalent.
3	Capacity	U1	RO	Number of slots in the carrier. Typical values are 1, 13, and 25. If unknown, the value is zero-length. This value is assured correct only after SlotMapStatus is SlotMapVerificationOK.
4	Carrier AccessingStatus	U1	RO	Current state of accessing the material contained in the carrier. 0 = NOT ACCESSED 1 = IN ACCESS 2 = CARRIER COMPLETE (Process finished normally) 3 = CARRIER STOPPED (Process finished abnormally)
5	CarrierIDStatus	U1	RO	Current state of the Carrier ID Verification. 0 = ID NOT READ 1 = WAITING FOR HOST 2 = ID VERIFICATION OK 3 = ID VERIFICATION FAILED
6	ContentMap	L	RO	Format is: <L [NumberOfSlots] <L [2] <A[0..80] LotId > <A[0..80] SubstrateID > > ... > Ordered list of two-element lists containing LotId and SubstrateID (WaferID), corresponding to Carrier Slots 1, 2, ... n. The equipment updates this attribute as it inserts and removes wafers from the carrier.
7	LocationID	A [0..80]	RO	Current Location of the carrier within the equipment. If the carrier has not yet arrived, LocationID is zero-length.

#	Attribute name	Format	Access	Description
8	SlotMap	L	RO	Ordered list corresponding to the Carrier Slots 1, 2, ..n. Shows the status of each slot in the carrier. Format is: <L [NumberOfSlots] <U1 SlotStatus> ... > Values for SlotStatus are: 1 = EMPTY. The slot contains no Substrate and is clear of obstructions. 2 = NOT EMPTY. The slot appears to contain some abnormal obstruction, but not a correctly-positioned substrate. The SlotStatus values 4 and 5 can be considered more detailed sub-cases of this value, but some Slot Map reader hardware may not be able to distinguish among the sub-cases. 3 = CORRECTLY OCCUPIED. The slot contains a correctly-positioned Substrate. 4 = DOUBLE SLOTTED. The slot abnormally contains two Substrates. 5 = CROSS SLOTTED. The slot contains a Substrate that is abnormally positioned, with one side of the Substrate in this slot and the other side in another slot. This equipment does not use the value (0 = Undefined). Values {2, 4, and 5} are collectively referred to as Abnormal. Equipment may remove a Substrate from a slot with a SlotStatus of 3 = CORRECTLY OCCUPIED. The equipment can only insert a Substrate into a slot with a SlotStatus of 1 = Empty. The equipment should not attempt to remove or insert Substrates for slots with an Abnormal SlotStatus. SlotMap values are assured correct only after SlotMapStatus = SlotMapVerificationOK. With this status, NumberOfSlots is equal to the capacity of the carrier. Prior to this status, if the SlotMap is not yet known, the list length (NumberOfSlots) may be zero or different from the carrier capacity. The equipment updates this attribute as it inserts and removes wafers from the carrier.

#	Attribute name	Format	Access	Description
9	SlotMapStatus	U1	RO	The current status of Slot Map Verification. Values are: 0 = SLOT MAP NOT READY 1 = WAITING FOR HOST 2 = SLOT MAP VERIFICATION OK 3 = SLOT MAP VERIFICATION FAILED
10	SubstrateCount	U1	RO	Count of Substrates in the carrier. Once the value of SlotMapStatus is SlotMapVerificationOk, this equipment will force this attribute to agree with the number of wafers specified in the SlotMap. This corresponds to the number of slots with a status of 3 = CORRECTLY OCCUPIED. The equipment updates this attribute as it inserts and removes wafers from the carrier.
11	Usage	A [0..80]	RO	The usage of the Substrates contained in this carrier. If unknown, value is zero-length. Typical values are PRODUCT, TEST, FILLER, CLEANING, and so on. The host may specify the value in any combination of upper and lowercase letters
12	WID_Angle	L	RO	This attribute exists only if the Equipment Constant CfgWIDAngle is set to 0x01. Format is: <L [NumberOfSlots] <U2 WID_Angle_Value> ... > This attribute is an ordered list, corresponding to Carrier Slots 1, 2, and so forth. Each WID_Angle_Value defines the position of the physical wafer ID scribed on the wafer, expressed as a rotation angle from the normal alignment. If unknown, the value is zero-length.

E39 Port Object

The following table shows the attributes and descriptions for the E39 Port Object.

#	Attribute Name	Format	Access	Description
1	ObjType	A	RO	Port
2	ObjID	U1	RO	PortID. When a Port related event occurs, this variable contains the entire related (current) Port Object.
3	PortAccessMode	U1	RO	When an event related to a Load Port Event occurs, this variable contains the Access Mode value for the related (current) Load Port.
4	PortAssociationState	U1	RO	When an event related to a Load Port Event occurs, this variable contains the load port / carrier association state value for the related (current) Load Port.
5	PortReservationState	U1	RO	When an event related to a Load Event occurs, this Variable contains the PortReservationState value for the related (current) Load Port.
6	PortStateInfo	U1	RO	When an event related to a Load Event occurs, this Variable contains the PortStateInfo value for the related (current) Load Port. This is a combination of the PortAssociationState and the PortTransferState.
7	PortTransferState	U1	RO	When an event related to a Load Event occurs, this Variable contains the Load Port Transfer State Value for the related (current) Load Port.
8	ClampState	U1	RO	State of clamp for the load port, either GEM_OFF_STATE (0) or GEM_ON_STATE (1).

E39 Substrate Object

The following table shows the attributes and descriptions for the E39 Substrate Object.

#	Attribute name	Format	Access	Description
1	ObjType	A	RO	Substrate
2	ObjID	A [1..80]	RO	Substrate ID. This must consist of ASCII characters from 0x20 through 0x7E and cannot include the characters ?, *, ~, >, or :. Upper- and lowercase alphabetic characters are considered equivalent.
3	LotID	A [0..80]	RW	Identifier of the Lot associated with this Substrate, if any.
4	MaterialStatus	U1	RO	Equipment-defined values indicating the criteria of processing quality of the Substrate. If unknown, this value will be zero-length.
5	SubstDestination	A [0..80]	RO	The Substrate Location ID where the Substrate will be finally restored. If zero-length, then SubstDestination is implicitly the same as SubstSource.
6	SubstHistory	L	RO	Ordered list of three-element lists, showing the current history of the movement of the Substrate inside of the equipment. Format is: <L [NumberOfHistoryRecords] <L [3] <A [1..80] SubstLocID or BatchLocID.SubstPosIn Batch> <A [16] TimeIn> <A [16] TimeOut> > ... > TimeIn and TimeOut are in format YYYYMMDDhhmmsscc and show the date and time the Substrate entered and left that Location. The first entry is the SubstSource. For a Substrate that is in-process, the last entry shown will have a zero-length TimeOut. For a completed Substrate, the last entry is the SubstDestination and its TimeOut is zero-length.

#	Attribute name	Format	Access	Description
7	SubstLocID	A [1...80]	RO	Current Location of the Substrate. When the substrate is moving, it is shown at the starting SubstLoc until the move is finished and thereafter at the ending SubstLoc.
8	SubstProcState	U1	RO	The current processing state of the substrate. Values are: 0 = NEEDS PROCESSING 1 = IN PROCESS 2 = PROCESSED 3 = ABORTED 4 = STOPPED 5 = REJECTED 6 = LOST 7 = SKIPPED
9	SubstSource	A [1..80]	RO	The starting Location for the Substrate.
10	SubstState	U1	RO	The Transport State of the substrate. Values are: 0 = AT SOURCE 1 = AT WORK 2 = AT DESTINATION
11	SubstType	U1	RW	The type of Substrate. Values are: 0 = WAFER 1 = FLAT PANEL 2 = COMPACT DISK 3 = MASK OR RETICLE If unknown, this value will be zero-length.
12	SubstUsage	U1	RW	The usage of the Substrate. Values are: 0 = PRODUCT 1 = TEST 2 = FILLER 3 = CLEANING Other values may be factory-specific. If the usage is unknown, this value will be zero-length.

#	Attribute name	Format	Access	Description
13	SubstWID_Angle	U2	N/A	The position of the physical Wafer ID scribed on the wafer, expressed as a rotation angle from the normal alignment. If the position is unknown, the value is zero-length. This attribute exists only if the Equipment Constant CfgWIDAngle (on page 4-5) is set to 0x01.
14	BatchLocID	A [1..80]	RO	Batch Location at which the Substrate is currently located. This value is undefined if the Substrate is currently located or moving from a Substrate Location.
15	SubstPosInBatch	A [1..80]	RO	Position in the Batch Location where the substrate is currently located. This value is undefined if the substrate is currently located or moving from a substrate Location.

E39 Substrate Location Object

The following table shows the attributes and descriptions for the E39 Substrate Location Object.

#	Attribute name	Format	Access	Description
1	ObjType	A	RO	SubstLoc
2	ObjID	A [1..80]	RO	Substrate Location ID. This must consist of ASCII characters from 0x20 through 0x7E and cannot include the characters ?, *, ~, >, or :. Upper and lowercase alphabetic characters are considered equivalent.
3	SubstID	A [0..80]	RO	The identifier of the Substrate currently at this Location, if any. This value is zero-length if there is no Substrate at this Location.
4	SubstLocState	U1	RO	Displays whether this Location is occupied by a Substrate. Values are: 0 = UNOCCUPIED 1 = OCCUPIED

E39 Control Job Object

The following table shows the attributes and descriptions for the E39 Control Job Object.

#	Attribute name	Format	Access	Description
1	ObjType	A	RO	ControlJob
2	ObjID	A [1..80]	RO	ControlJobID This must consist of ASCII characters from 0x20 through 0x7E and cannot include the characters ?, *, ~, >, or :. Upper- and lowercase alphabetic characters are considered equivalent.
3	CarrierInputSpec	L	RW	This equipment recommends that the host set the format of this attribute as: <L> This equipment determines the carriers required for this Control Job by examining the Process Jobs. If the host specifies a value, it must have the following format: <L [NumberOfCarriers] <A CarrierID> ... > Specification of this parameter is optional. **Note:** ConX300 ignores CarrierInput Spec and does not attempt to match it to the material specified in the Process Job object. Zero-length if there is no CarrierID associated with the Control Job.
4	CurrentPrJob	L	RO	A list of all Process Jobs within this Control Job with a PrJobState (on page 2-14) of ACTIVE (any sub-state). Format is: <L [NumberOfPrjobs] <A [1..80] PrJobID> ... > This value may be zero-length.
5	DataCollectionPlan	A [0..80]	RW	The identifier for a data collection plan to be used during execution of the Control Job. May be zero-length, indicating no Data Collection Plan. This equipment ignores this attribute.

#	Attribute name	Format	Access	Description

6	MtrlOutByStatus	L	RW	Specifies the Carrier Substrate Locations where processed material will be placed based on the Substrate Object MaterialStatus (on page 2-7).
				
				Format is:
				
				`<L [NumberOfStatuses]`
				`<L [2]`
				`<U1 MaterialStatus>`
				`<L [2]`
				`<A CarrierID>`
				`<L [NumberOfSlots]`
				`<U1 SlotID>`
				`... /*More SlotIDs*/`
				`>`
				`>`
				`>`
				`... /*More MaterialStatuses*/`
				`>`
				
				If NumberOfSlots is zero, the equipment may output Substrates to any available SlotID in the specified carrier.

7	MtrlOutSpec	L	RW	Maps material from source to destination after processing. If zero-length, then substrates are returned to their starting Location.
				
				Format is:
				
				`<L [NumberOfMaps]`
				`<L [2]`
				`<L [2]/* Source Map */`
				`<A CarrierID>`
				`<L [NumberOfSlotsSource]`
				`<U1 SlotID>`
				`... /* More Slots */`
				`>`
				`>`
				`<L [2]/*Destination Map*/`
				`<A CarrierID>`
				`<L [NumberOfSlotsDest]`
				`<U1 SlotID>`
				`.../* More Slots */`
				`>`
				`>`
				`>`
				`... /* More Maps */`
				`>`
				
				If NumberOfMaps = 0, then the destination of each wafer is the same as its source Location.
				
				If the host specifies values, then there must be a one-to-one correspondence between input slots and output slots.

#	Attribute name	Format	Access	Description

8	PauseEvent	L	RW	A list of events that will cause this job to pause. This value may be zero-length.
				
				Format is:
				
				`<L`
				`  <U4 CEID>`
				`  ...`
				`>`

9	ProcessingCtrlSpec	L	RW	Defines the Process Jobs that will be run within this Control Job as well as the execution rules for each.
				
				Format is:
				
				`<L [NumberOfPjobs]`
				`  <L [3]`
				`  <A PrJobID>`
				`  <L [NumberOfControlRules]`
				`  <L [2]  /Control Rule/`
				`  <A [1..80] RuleName>`
				`  <RuleValue>`
				`  >`
				`  .../*More Control Rules*/`
				`  <L [NumberOfOutputRules]`
				`  <L [2]`
				`  <U1 MaterialStatus`
				`  <ThresholdValue>`
				`  >`
				`  ... /*More Output Rules*/`
				`  >`
				`  >`
				`  ... /* More Process Jobs */`
				`>`
				
				NumberOfPjobs must be 1 or greater.
				NumberOfControlRules may be 0 (no Control Rules for the Process Job).
				NumberOfOutputRules may be 0 (no Output Rules for the Process Job).

10	ProcessOrderMgmt	U1	RW	Specifies the method for the order in which Process Jobs are initiated within this Control Job. Values are: 1 = ARRIVAL. Process Jobs whose material has arrived at the equipment are initiated in the order specified in the Control Job Object ProcessingCtlSpec. Process Jobs whose material has not yet arrived remain pooled until it arrives. 2 = OPTIMIZE. The equipment chooses the best method. 3 = LIST. Process Jobs are initiated in the order specified in ProcessingCtrlSpec.

#	Attribute name	Format	Access	Description
11	PRJobStatusList	L	RO	CtrlJobPRJobStatusList is a list of associated Process Jobs and their status. Format is: <L [NumberOfPjobs] <L <A PRJobID> <I4 PRJobState> > ... >
12	StartMethod	Boolean	RO	Specifies whether this job starts automatically or waits for a User Start (such as a host S16F27 Start command or equivalent local operator command). Values are: TRUE = Automatic Start FALSE = User Start
13	State	U1	RO	The current state of the Control Job. Values are: 0 = QUEUED 1 = SELECTED 2 = WAITING FOR START 3 = EXECUTING 4 = PAUSED 5 = COMPLETED

E39 Process Job Object

The following table shows the attributes and descriptions for the E39 Process Job Object.

#	Attribute name	Format	Access	Description
1	ObjType	A	RO	ProcessJob
2	ObjID	A [1..80]	RO	ProcessJobID This must consist of ASCII characters from 0x20 through 0x7E and cannot include the characters ?, *, ~, >, or :. Upper- and lowercase alphabetic characters are considered equivalent.
3	PauseEvent	L	RO	A list of events that will cause this Job to pause. Format is: <L> For this equipment, the list must always be zero-length.
4	PrJobState	U1	RO	The Process State of the job. Equipment constant E40PrJobStateValues can be set to support current or legacy values. Enumerated: When E40PrJobStateValues = 0. SEMI E40-1101 and later. PrJobState values are: 0 = QUEUED/POOLED 1 = SETTING UP 2 = WAITING FOR START 3 = PROCESSING 4 = PROCESS COMPLETE 5 = RESERVED 6 = PAUSING 7 = PAUSED 8 = STOPPING 9 = ABORTING 10 = STOPPED 11 = ABORTED When E40PrJobStateValues = 1. Legacy Formats, pre-SEMI E40-1101. PrJobState values are: 0 = QUEUED/POOLED 1 = SETTING UP 2 = WAITING FOR START 3 = PROCESSING 4 = PROCESS COMPLETE 5 = PAUSING 6 = PAUSED 7 = STOPPING 8 = ABORTING

#	Attribute name	Format	Access	Description
5	PrMtlNameList	L	RO	A list of the material to be processed by this Job. If PrMtlType specifies Carrier, format is: <L [NumberOfCarriers] <L [2] <A CarrierID> <L [NumberOfSlots] <U1 SlotID> ... /* More SlotIDs */ > > ... /* More Carriers */ > For this equipment, if NumberOfSlots = 0, then all Slots of the specified Carrier whose SlotStatus is CorrectlyOccupied will be processed. If PrMtlType specifies Substrate, format is: <L [NumberOfSubstrates] <A SubstrateID> ... /* More Substrates */ > NumberOfSubstrates should be greater than zero. If this Process Job has no material, the format is: <L>
6	PrMtlType	B	RO	The units of material specified. This equipment ignores any value set by the host when it creates the job. Instead, this equipment deduces the Material units from PrMtlNameList and forces PrMtlType to one of the following values: <B 0x0D> = Carrier <B 0x0E> = Substrate <B> = No Material in this Process Job
7	PrProcessStart	Boolean	RO	Specifies whether this job starts automatically or waits for a User Start (such as a host S16F5 Start command or an equivalent local operator command). Values are: TRUE = AUTOMATIC START FALSE = MANUAL START
8	PrRecipeMethod	U1	RO	Indicates whether Recipe Variables are used. The host sets this value when it creates the job. Values are: 1 = RECIPE ONLY (Recipe without recipe variables) 2 = RECIPE WITH RECIPE VARIABLES

#	Attribute name	Format	Access	Description
9	RecID	A [1..80]	RO	The identifier of the Recipe or Process Program to be used with this Process Job.
10	RecVariableList	L	RO	Format is: <L [NumberOfVariables] <L [2] <A [1..80] RCPPARNM> <RCPPARVAL> > ... > The format of RCPPARVAL can be {B, BOOLEAN, A, Ix, Ux, or Fx}. Values specified here override nominal values in the Process Program or Recipe. The RCPPARNM and RCPPARVAL values allowed here depend on the nature of the Process program or Recipe specified in RecID. NumberOfVariables may be 0 (no parameters).

E39 Equipment Performance Tracking (EPT) Object

The following table shows the attributes and descriptions for the E39 Equipment Performance Tracking (EPT) Object.

#	Attribute name	Format	Access	Description
1	ObjType	A	RO	EPTTracker
2	ObjID	A [1..80]	RO	EPT Object ID This ID is defined by the equipment and cannot be changed by the host.
3	BlockedReason	U1	RO	A code that identifies the reason that the object is blocked. Values are: 0 = Not Blocked 1 = Unknown 2 = Safety Threshold 3 = Error Condition 4 = Parametric Exception 5 = Aborting, Aborted 6 = Pausing, Paused 7 = Reserved 8 = Reserved 9 = Reserved This code is meaningful only if the most recent EPT state transition was 5, 8, or 9. For other transitions, the value is 0 (Not Blocked).
4	BlockedReasonText	A [0..80]	RO	Text that describes why this object is blocked. This text can provide further details to BlockedReason. When BlockedReason is 0 (Not Blocked), this value is <A[0]> (zero-length).
5	DisableEventOnTransition	<U1 0>	RO	DisableEventOnTransition is a collection of transitions that will not be reported as a Host Event when they occur as part of EPTTracker operations. The list can be from 0 to 9 transitions. Format is: <L <U1 TRANSITION> ... >

#	Attribute name	Format	Access	Description
6	EPTElementType	U1	RO	Type of this EPT Object. Values are: 0 = Equipment 1 = Production EPT Module 2 = EFEM/LoadPort EPT Module
7	EPTState	U1	RO	The current EPT state of this Object. Values are: 0 = Idle 1 = Busy 2 = Blocked
8	EPTStateTime	U4	RO	Time in seconds spent in the previous EPTState prior to entering the current EPTState.
9	EPTElementName	A [0..80]	RW	A name for this object which can be set by the factory host by setting EPTElementName.
10	PreviousEPTState	U1	RO	The previous EPTState for this EPT Object, prior to entering the current EPTState. Values are: 0 = Idle 1 = Busy 2 = Blocked 3 = No State (Power Up)
11	PreviousTaskName	A [0..80]	RO	The name of the EPT Task previously running on this EPT object prior to starting the current EPT task. When PreviousTaskType is 0, this value is <A[0]> (zero-length).

#	Attribute name	Format	Access	Description
12	PreviousTaskType	U1	RO	The EPT Task type for the task that ran previously. Values are: 0 = No Task 1 = Unspecified 2 = Process - adding value (for example, Exposing) 3 = Support - incapable of adding value (for example, Handling or Transport) 4 = Equipment Maintenance (for example, an equipment-initiated clean cycle) 5 = Equipment Diagnostics (for example, an equipment-initiated health check) 6 = Waiting
13	TaskName	A [0..80]	RO	The EPT Task name that is currently running. When TaskType is 0, this value is <A[0]> (zero-length).
14	TaskType	U1	RO	The type of EPT Task currently running on this EPT Object. Values are: 0 = No Task 1 = Unspecified 2 = Process - adding value (for example, Exposing) 3 = Support - incapable of adding value (for example, Handling or Transport) 4 = Equipment Maintenance (for example, an equipment-initiated clean cycle) 5 = Equipment Diagnostics (for example, an equipment-initiated health check) 6 = Waiting

#	Attribute name	Format	Access	Description
15	EPTTransitionTimestamp	A [0..32]	RO	Timestamp When the most recent transition and its related event occurred, triggering this EPT Object to its current state. The format of the EPTTransitionTimestamp attribute is controlled by the GemTimeFormat Equipment Constant. If GemTimeFormat = 0, the time will be in 12-byte format: YYMMDDHHMMSS If GemTimeFormat = 1, the time will be in 16-byte format: YYYYMMDDHHMMSSCC If GemTimeFormat = 2, the time will be in 32-byte format: YYYY-MM-DDThh:mm:ss.sTZD
16	Transition	U1	RO	The most recent transition that updated this EPT Object. Values are: TRANSITION_1 = 1 TRANSITION_2 = 2 TRANSITION_3 = 3 TRANSITION_4 = 4 TRANSITION_5 = 5 TRANSITION_6 = 6 TRANSITION_7 = 7 TRANSITION_8 = 8 TRANSITION_9 = 9
17	TrackerEventID	I4	RO	The Event ID (CEID) that is triggered for a change in the state model.

E39 Global Object

The following table shows the attributes and descriptions for the E39 Global Object.

#	Attribute Name	Format	Access	Description
1	ObjType	A	RO	Global
2	ObjID	A [1..80]	RO	ConX
3	CarrierLocationMatrix	L	RO	Shows all Carrier Locations in the Equipment, and the Carrier ID currently at that Location, if any. Format is: <L [NumberOfLocations] <L[2] <A [1..80] LocationID> <A [0..80] CarrierID> > ... >. An ordered list, corresponding to Load Port 1, 2, ... If there is no Carrier at a given Location, the CarrierID at that location with be zero-length. When a Carrier is moving between two Locations, it is shown at the starting Location until the move is finished, and thereafter at the ending Location. This Variable shows all Carriers currently in the equipment whose CarrierID is known. It does not show Carriers which have been predicted by Bind or Carrier Notification, but which have not yet arrived, nor Carriers whose CarrierID is unknown. Valid if Carrier Location Objects are supported by the Equipment.
4	EPTClock	A [0..32]	RO	EPTClock gives transition time for the last EPT state transition. When used in event reporting, the clock represents the timestamp for the occurrence of the event. The format of EPTClock is controlled by the GemTimeFormatEC. If GemTimeFormatEC is set to: 0, the time will be in the 12-byte format YYMMDDhhmmss 1, the time will be in the 16-byte format YYYYMMDDhhmmsscc 2, the GemE50308EC is set to 1, the time will be in the max 32-byte format YYYY-MM-DDThh:mm:ss.sTZD
5	NumBlocked	U1	RO	Number of BLOCKEDProduction EPT Trackers on the equipment. Excludes EFEM/LoadPort EPT Trackers.

#	Attribute Name	Format	Access	Description
6	NumBusy	U1	RO	Number of BUSY Production EPT trackers on the equipment. Excludes EFEM/LoadPort EPT Modules.
7	NumIdle	U1	RO	Number of IDLE Production EPT modules on the equipment. Excludes EFEM/LoadPort EPT Modules.
8	PortAccessModeList	L	RO	Provides a list of the AccessMode (MANUAL = 0, AUTOMATIC = 1) for all defined Ports List of n items, where n = number of load ports on the system. Each item inside the list is a U1 enumerated value indicating the AccessMode of each port. Values are: 0 = MANUAL 1 = AUTO Format is: <L [NumberOfPorts] <U1 1> /* Port 1 access mode */ <U1 0> /* Port 2 access mode */ ... <U1 1> /* Port n access mode */ > .
9	PortAssociationStateList	L	RO	Shows the E87 Load Port Carrier Association State for all Load Ports on the equipment. Format is: <L [NumberOfPorts] <U1 PortAssociationState> ... > An ordered list, corresponding to Load Port 1, 2,...

#	Attribute Name	Format	Access	Description
10	PortCarrierIDList	L	RO	Provides a list of Carrier IDs for all defined ports. List of n items, where n = number of load ports on the system. Each item inside the list is an A[0..80] string identifier of the CarrierID at the specific port. Format is: <L [NumberOfPorts] <A "CS001"> /* Carrier ID at Port 1 */ <A "CS002"> /* Carrier ID at Port 2 */ ... <A "CS00N"> /* Carrier ID at Port N */ > .
11	PortList	L	RO	The numerical list of all load ports on the equipment. Format is: <L [NumberOfPorts] <U1 PTN> ... > An ordered list, corresponding to Load Port 1,2,...
12	PortReservationStateList	L	RO	Represents the list of reservation states for all registered ports. Format is: <L [NumberOfPorts] <U1 PortReservationState> ... > An ordered list, corresponding to Load Port 1,2,... For details of codes, see PortReservationState.

#	Attribute Name	Format	Access	Description
13	PortStateInfoList	L	RO	Shows information about all Load Ports on the equipment. Format is: <L [NumberOfPorts] <L[2] <U1 PortAssociation State1> <U1 PortTransfer State1> > ... > An ordered list, corresponding to Load Port 1,2,... For details of codes, see PortAssociationState and PortTransferState.
14	PortTransferStateList	L	RO	Shows the E87 Load Port Transfer State for all registered Load Ports on the equipment. Format is: <L [NumberOfPorts] <U1 PortTransferState> ... > An ordered list, corresponding to Load 1,2,... For details of codes, see PortTransferState.
15	PRMtrlOrder	U1	RO	Sets the processing order for material in the PJ Material List. 1 = ARRIVAL - Process whichever material arrives first. 2 = OPTIMIZE - Process in an order that maximizes throughput. 3 = LIST - Follow the order in the list.
16	QueueAvailableSpace	U2	RO	Indicates how many additional Control Jobs the Host can create at this time. The Equipment computes this value as the maximum, as per the Equipment Constant CtrlMaxJobSpace, less the count of existing control Jobs whose state is QUEUED. The Equipment will reject any Host attempt to create a Control Job when QueueAvailableSpace is zero. See S16F22 Process Job Space Send (on page 7-68).

#	Attribute Name	Format	Access	Description
17	QueuedCJobs	L	RO	A list of all queued Control Jobs. The list is in queue order, with HeadOfQueue first. Format is: <L[NumberOfQueControlJobs] <A CtrlJobID> /* HOQ */ <A CtrlJobID> ... >.
18	Reason	U1	RO	When Carrier State Transition #7 occurs, it shows the reason for the transition. Values are: 2 = CARRIER ID READ FAIL 4 = WRONG PORT When Carrier State Transition #9 or Carrier State Transition #16 occurs, it shows the reason for the transition. Values are: 5 = CANCEL CARRIER COMMAND RECEIVED FROM HOST 6 = EQUIPEMNT-INITIATED CANCEL CARRIER DUE TO DUPLICATE CARRIER ID When Carrier State Transition #14 occurs, it shows the reason for the transition. Values are: 0 = SLOT MAP VERIFICATION NEEDED 1 = SLOT MAP VERIFICATION BY EQUIPMENT UNSUCCESSFUL 2 = SLOT MAP READ FAILURE 3 = SLOT MAP IMPROPER SUBSTRATE POSITION
19	SubstDestinationList	L	RO	An order list of Substrate Destination IDs associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <A [0..80] SubstLocID[1]> <A [0..80] SubstLocID[2]> ... <A [0..80] SubstLocID[n] >.

#	Attribute Name	Format	Access	Description
20	SubstHistoryList	L	RO	An order list of Substrate Histories associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <L <L [3] <A [1..80] SubstLocID> <A [16] TimeIn> <A [16] TimeOut> > ... > ... >.
21	SubstIDList	L	RO	An order list of Substrate IDs associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <A [1..80] SubstID[1]> <A [1..80] SubstID[2]> ... <A [1..80] >.
22	SubstLocIDList	L	RO	An order list of Substrate Location IDs associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <A [0..80] SubstLocID[1]> <A [0..80] SubstLocID[2]> ... <A [0..80] SubstLocID[n]> >

#	Attribute Name	Format	Access	Description
23	SubstLotIDList	L	RO	An order list of Substrate Lot IDs associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <A [0..80] SubstLotID[1]> <A [0..80] SubstLotID[2]> ... <A [0..80] SubstLotID[n]> >
24	SubstLocStateList	L	RO	An ordered list of GemSubstLocState values. Each corresponds to Substrate Location IDs in the SubstLocIDList state variable that is associated with a Substrate Location-related State Model Transition Collection Event. Format is: <L [NumberOfSubstrateLocationsTransitioned] <U1 GemSubstLocState[1]> <U1 GemSubstLocState[2]> ... <U1 GemSusbtLocState[n]> >
25	SubstMtrlList	L	RO	An order list of Substrate Material Status associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <U1 SubstMtrlStatus[1]> <U1 SubstMtrlStatus[2]> ... <U1 SubstMtrlStatus[n]> >.

#	Attribute Name	Format	Access	Description
26	SubstProcStatList	L	RO	An ordered list of GemSubstProcState values. Each corresponds to Substrate IDs in the SubstIDList status variable that is associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfSubstratesTransitioned] <U1 GemSubstProcState[1]> <U1 GemSubstProcState[2]> ... <U1 GemSubstProcState[n]> >.
27	SubstSourceList	L	RO	An order list of Substrate Source Location IDs associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <A [0..80] SubstLocID[1]> <A [0..80] SubstLocID[2]> ... <A [0..80] SubstLocID[n]> >.
28	SubstStateList	L	RO	An ordered list of GemSubstState values. Each corresponds to Substrate IDs in the SubstIDList status variable that is associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOFSubstratesTransitioned] <U1 GemSubstState[1]> <U1 GemSubstState[2]> ... <U1 GemSubstState[n]> >.

#	Attribute Name	Format	Access	Description
29	SubstTypeList	L	RO	An order list of Substrate Types associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <U1 SubstType[1]> <U1 SubstType[2]> ... <U1 SubstType[n]> >.
30	SubstUsageList	L	RO	An order list of Substrate Usages associated with a Substrate-related State Model Transition Collection Event. Format is: <L [NumberOfTransitionedSubstrates] <U1 SubstUsage[1]> <U1 SubstUsage[2]> ... <U1 SubstUsage[n]> >.
31	AlarmInfo	L	RO	This variable is a two-element list that includes the alarm ID and alarm description. It will be populated when Alarm On and Alarm Off events are activated. Format is: <L [2] <U4 Alarm ID> <A Alarm Description> >.

Section 3

Events

In this section:

Introduction

This chapter describes the collection events implemented in the equipment to support the following standards:

- SEMI E87 Carrier Management
- SEMI E90 Substrate Management
- SEMI E94 Control Job Management
- SEMI E40 Process Management
- SEMI E30 GEM
- Other collection events implemented by the equipment

SEMI E87 Carrier Management Events

This section describes collection events related to the SEMI E87 Carrier Management standard.

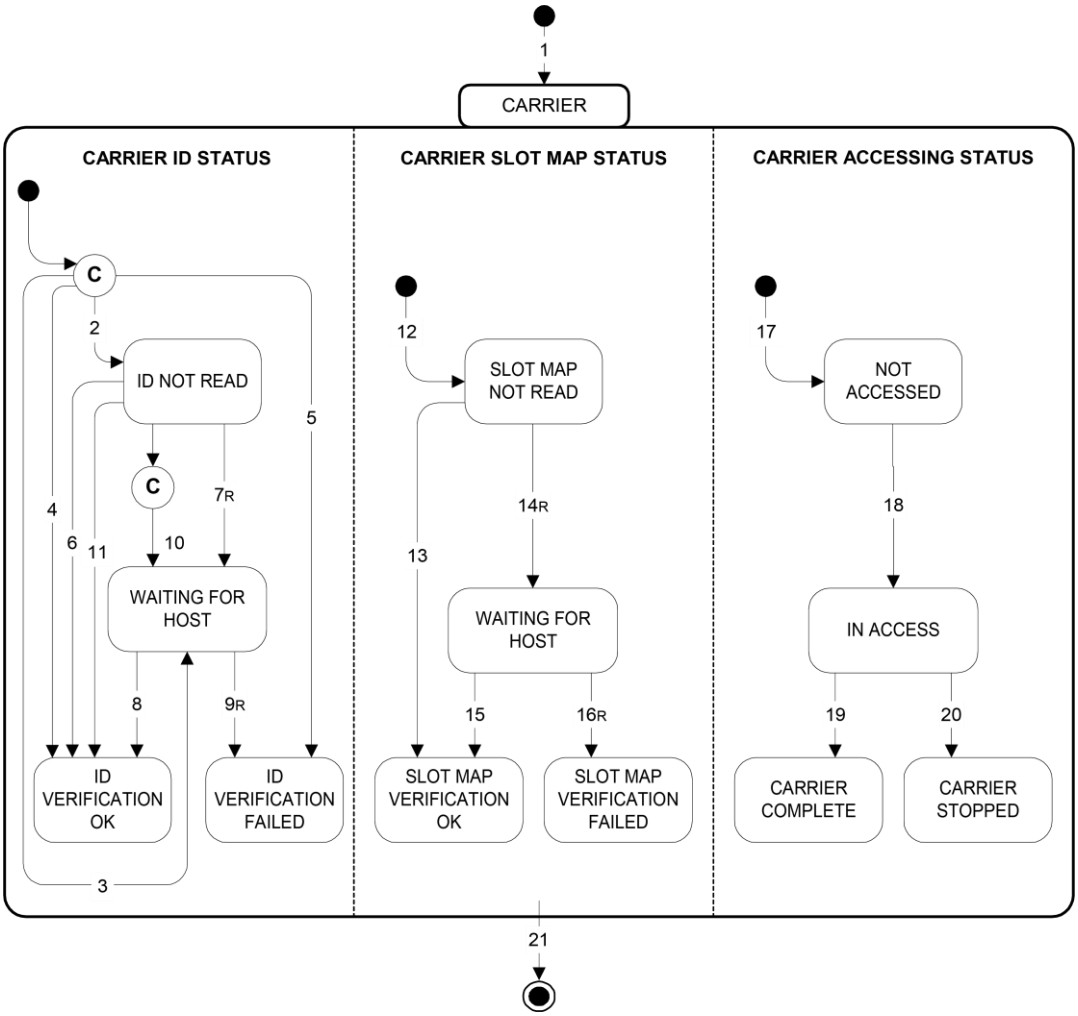
Carrier State Model

The following figure shows a Carrier State Model. The Carrier State Transition Events that follow are used with this model.

NOTE

An **R** next to a transition arrow number indicates that the `Reason` variable gives further information.

Figure 1: Carrier State Model



For more information, see CEIDs 5104 through 5140 in Carrier State Transition Events (on page 3-3).

Carrier State Transition Events

The following SEMI E87 events relate to a carrier. The current Carrier Data Variables display the attributes of the related Carrier Object. See the Carrier State Model (on page 3-1) at the end of this section for more information.

CEID	Name and description
5104	`CarrierClosed` The carrier door has successfully closed. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.
5105	`CarrierIDReadFail` The equipment's Carrier ID Reader has failed to read the Carrier ID. When this event occurs, this equipment saves the related Load Port data to the current Load Port Data Variables.
5106	`CarrierLocationChange` The equipment has successfully moved the carrier from one Carrier Location to another. When this event occurs, this equipment saves the related Carrier and Carrier Location data to the corresponding current Data Variables.
5107	`CarrierClamped` The equipment reports that a carrier has been clamped at a Load Port, so that it cannot be removed by an operator or AMHS. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.
5108	`CarrierUnclamped` The equipment reports that a carrier has been unclamped at a Load Port so that the operator or AMHS can unload it. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.
5109	`CarrierTagReleased` The equipment sends this event after a completed (or stopped) carrier has been held at the Tag Write location, and then released by a host `S3F17 CarrierRelease` command. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.
5110	`CarrierOpened` The carrier door has been successfully opened. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.

CEID	Name and description
5111	CarrierSMTrans01 SEMI E87 Carrier State Model Transition #1 has occurred. The Carrier Object is created. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5112	CarrierSMTrans02 SEMI E87 Carrier State Model Transition #2 has occurred. This event implies that Carrier State Model Transitions #1, #12, and #17 have also occurred. The Carrier Object transits from no state to ID NOT READ state. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5113	CarrierSMTrans03 SEMI E87 Carrier State Model Transition #3 has occurred. This event implies that Carrier State Model Transitions #1, #12, and #17 have also occurred. The Carrier Object transits from no state to WAITING FOR HOST state. A normal transition is indicated by a successful reading of a new CarrierID by the equipment. An abnormal transition is indicated when the equipment fails to verify a successful CarrierID read operation. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables.
5114	CarrierSMTrans04 SEMI E87 Carrier State Model Transition #4 has occurred. This event implies that Carrier State Model Transitions #1, #12, and #17 have also occurred. The Carrier Object transits from no state to ID VERIFICATION OK state. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5115	CarrierSMTrans05 SEMI E87 Carrier State Model Transition #5 has occurred. This event implies that Carrier State Model Transitions #1, #12, and #17 have also occurred. The Carrier Object transits from no state to ID VERIFICATION FAILED state. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5116	CarrierSMTrans06 SEMI E87 Carrier State Model Transition #6 has occurred. The Carrier Object transits from ID NOT READ state to ID VERIFICATION OK state. The Carrier ID is read correctly then successfully acknowledged by the equipment. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables.

CEID	Name and description
5117	CarrierSMTrans07 SEMI E87 Carrier State Model Transition #7 has occurred. The Carrier Object transits from ID NOT READ state to WAITING FOR HOST state. The CarrierID has not been read by the equipment. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables, and the variable Reason shows the detail reason causing this event.
5118	CarrierSMTrans08 SEMI E87 Carrier State Model Transition #8 has occurred. The Carrier Object transits from WAITING FOR HOST state to ID VERIFICATION OK. The carrier proceeds on with operation. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables.
5119	CarrierSMTrans09 SEMI E87 Carrier State Model Transition #9 has occurred. The Carrier Object transits from WAITING FOR HOST state to ID VERIFICATION FAILED. The carrier is canceled. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables, and the variable Reason shows details of why the event has occurred.
5120	CarrierSMTrans10 SEMI E87 Carrier State Model Transition #10 has occurred. The Carrier Object transits from ID NOT READ to WAITING FOR HOST. A carrier arrived at a port with a Bind, there is no Carrier ID reader, and the Equipment Constant BypassReadID is set to FALSE. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables.
5121	CarrierSMTrans11 SEMI E87 Carrier State Model Transition #11 has occurred. The Carrier Object transits from ID NOT READ to ID VERIFICATION OK. A carrier arrived at a port with a Bind, there is no Carrier ID reader, and the Equipment Constant BypassReadID is set to TRUE. When this event occurs, this equipment saves the related Carrier and Load Port data to the current Load Port and current Carrier Data Variables.
5122	CarrierSMTrans12 SEMI E87 Carrier State Model Transition #12 has occurred. The Carrier Object transits from no state to SLOT MAP NOT READ state. The carrier is instantiated. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.

CEID	Name and description
5123	CarrierSMTrans13 SEMI E87 Carrier State Model Transition #13 has occurred. The Carrier Object transits from SLOT MAP NOT READ state to SLOT MAP VERIFICATION OK state. The equipment has read and verified the Slot Map successfully. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.
5124	CarrierSMTrans14 SEMI E87 Carrier State Model Transition #14 has occurred. The Carrier Object transits from SLOT MAP NOT READ state to WAITING FOR HOST state. The variable Reason shows the trigger for this transition. 0 = A successful reading of the Slot Map with the equipment waiting for host verification. 1 = A successful reading of the Slot Map but a failure by the equipment to verify the reading of the Slot Map. 2 = The Slot Map cannot be read. 3 = There is an anomaly with a wafer's position in the Carrier. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables, and the Reason variable shows the event details.
5125	CarrierSMTrans15 SEMI E87 Carrier State Model Transition #15 has occurred. The Carrier Object transits from WAITING FOR HOST to SLOT MAP VERIFICATION OK. The Carrier proceeds with its operation. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables.
5126	CarrierSMTrans16 SEMI E87 Carrier State Model Transition #16 has occurred. The Carrier Object transits from WAITING FOR HOST to SLOT MAP VERIFICATION FAIL State. The Carrier should be canceled. When this event occurs, this equipment saves the related Carrier, Load Port, and Carrier Location data to the corresponding current Data Variables, and the Reason variable shows the event details.
5127	CarrierSMTrans17 SEMI E87 Carrier State Model Transition #17 has occurred. The Carrier Object is instantiated. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.

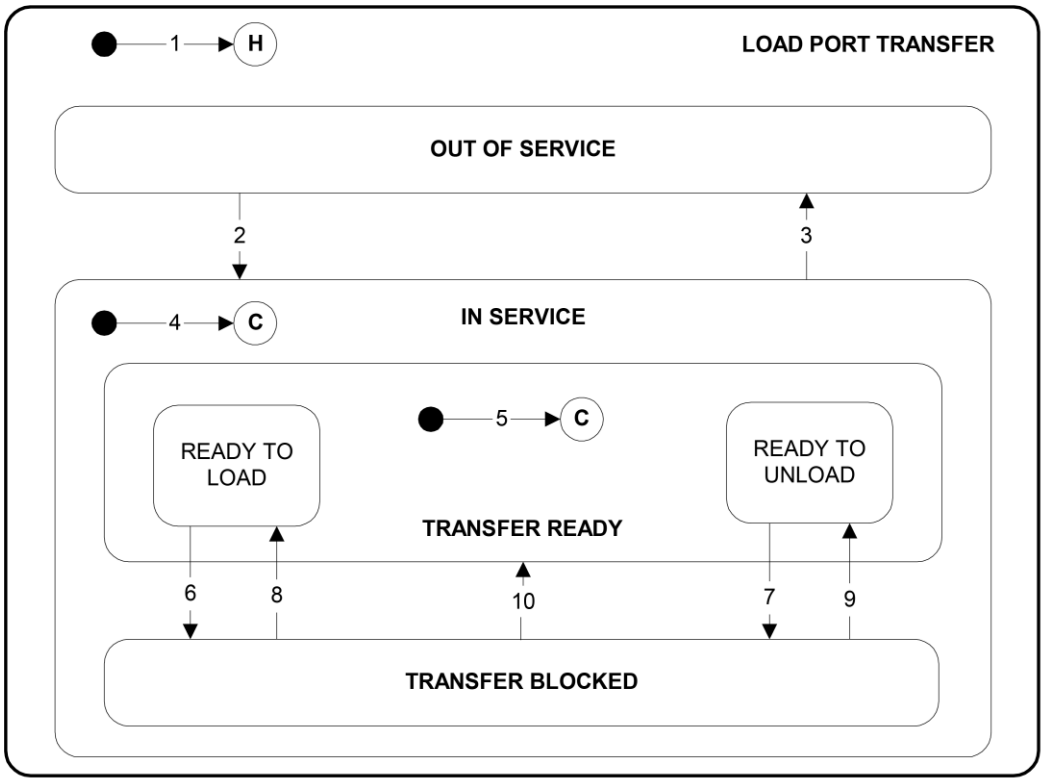
CEID	Name and description
5128	CarrierSMTrans18 SEMI E87 Carrier State Model Transition #18 has occurred. The Carrier Object transits from the NOT ACCESS state to IN ACCESS state. The equipment begins its Carrier entry operation. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5129	CarrierSMTrans19 SEMI E87 Carrier State Model Transition #19 has occurred. The Carrier Object transits from IN ACCESS state to CARRIER COMPLETE state. This event indicates that the equipment has completed its Carrier accessing operation successfully. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5130	CarrierSMTrans20 SEMI E87 Carrier State Model Transition #20 has occurred. The Carrier Object transits from IN ACCESS state to CARRIER STOPPED state. This event indicates that the equipment did not successfully perform its Carrier accessing operation. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5131	CarrierSMTrans21 SEMI E87 Carrier State Model Transition #21 has occurred. The Carrier Object transits from CARRIER state to no state. This event can be triggered by the following events: 1. A normal transaction results when the Carrier is removed from the equipment. 2. An abnormal transaction results when a CancelBind, CancelCarrier, CancelCarrierAtPort, or CancelCarrierNotification precedes the loading of the Carrier. 3. The equipment fails to verify Carrier and initiates its own CancelBind operation. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5132	DuplicateCarrierIDInProcess The equipment has detected that a newly loaded Carrier has the same Carrier ID as another Carrier already in process in the equipment. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.
5140	CarrierApproachingComplete This SEMI E87 event is signaled by the user's ECS. It should be signaled a "reasonable" time before the CarrierComplete event occurs. The SEMI E87 standard does not specify the trigger, but this may be a computed time prior to the expected completion of processing the last wafer of a Carrier. When this event occurs, this equipment saves the related Carrier data to the current Carrier Data Variables.

CEID	Name and description
5153	`UnknownCarrierID` Indicates when a carrier arrives to a load port that is not associated and whose carrier ID reader is not available. When this event occurs, the equipment saves the related Load Port data to the current Load Port data variables.

Load Port State Model

The following figure shows a Load Port State Model. The following sections show Events for this model.

Figure 2: Load Port State Model



For information, see CEIDs 5141 through 5150 in Load Port Transfer State Model Transition Events (on page 3-9).

Load Port Transfer State Model Transition Events

The following events relate to SEMI 87 Load Port Transfer State Model Transitions. The current Load Port Data Variables show the related Load Port. See the Load Port State Model (on page 3-8) at the end of this section for more information.

CEID	Name and description
5141	PortTransferSMTrans01 Load Port Transfer Transition #1 has occurred. The Load Port object transits from no state to OUT OF SERVICE or IN SERVICE state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5142	PortTransferSMTrans02 Load Port Transfer Transition #2 has occurred. The Load Port object transits from OUT OF SERVICE state to IN SERVICE state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5143	PortTransferSMTrans03 Load Port Transfer Transition #3 has occurred. The Load Port object transits from IN SERVICE state to OUT OF SERVICE state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5144	PortTransferSMTrans04 Load Port Transfer Transition #4 has occurred. The Load Port object transits from IN SERVICE state to TRANSFER READY or TRANSFER BLOCKED state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5145	PortTransferSMTrans05 Load Port Transfer Transition #5 has occurred. The Load Port object transits from TRANSFER READY to READY TO LOAD or READY TO UNLOAD state. When this event occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5146	PortTransferSMTrans06 Load Port Transfer Transition #6 has occurred. The Load Port object transits from READY TO LOAD state to TRANSFER BLOCKED state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.

CEID	Name and description
5147	PortTransferSMTrans07 Load Port Transfer Transition #7 has occurred. The Load Port object transits from READY TO UNLOAD state to TRANSFER BLOCKED state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5148	PortTransferSMTrans08 Load Port Transfer Transition #8 has occurred. The Load Port object transits from TRANSFER BLOCKED state to READY TO LOAD state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5149	PortTransferSMTrans09 Load Port Transfer Transition #9 has occurred. The Load Port object transits from TRANSFER BLOCKED state to READY TO UNLOAD state. When this event occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5150	PortTransferSMTrans10 Load Port Transfer Transition #10 has occurred. The Load Port object transits from TRANSFER BLOCKED state to TRANSFER READY state. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.

Load Port/Carrier Association State Model Transition Events

The following events relate to SEMI E87 Load Port/Carrier Association State Model Transitions. The current Load Port Data Variables show the related Load Port. The current Carrier Data Variables show the related Carrier, if any.

CEID	Name and description
5133	AssocSMInit The Association Mode has been initialized to NOT ASSOCIATED. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5134	AssocSMGoAssoc The Load Port has transited from NOT ASSOCIATED to ASSOCIATED. When this event occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5135	AssocSMReAssoc The Load Port has transited from ASSOCIATED with one Carrier to ASSOCIATED with a different Carrier. When this event occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5136	AssocSMGoNotAssoc The Load Port has transited from ASSOCIATED to NOT ASSOCIATED. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.

Load Port Reservation State Model Transition Events

The following events relate to SEMI E87 Load Port Reservation State Model Transitions. The current Load Port Data Variables show the related Load Port.

CEID	Name and description
5137	`ReservationSMInit` The Load Port has been initialized to `NOT RESERVED`. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5138	`ReservationSMGoReserved` The Load Port has transited from `NOT RESERVED` to `RESERVED`. When this event occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5139	`ReservationSMGoNotReserved` The Load Port has transited from `RESERVED` to `NOT RESERVED`. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.

Load Port ID Reader Availability

The following events relate to SEMI 87 Load Port ID Reader Availability.

CEID	Name and description
5151	`IDReaderAvailable` The Carrier ID reader for the current Load Port has become available. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.
5152	`IDReaderUnavailable` The Carrier ID reader for the current Load Port has become unavailable. When this event occurs, this equipment saves the related Load Port data to the corresponding current Data Variables.

Load Port Access Mode Transition Events

The following events indicate E87 Load Port Access Mode Transitions. The current Load Port Data Variables show the attributes of the related Load Port.

CEID	Name and description
5101	`AccessSMInit` Initialization (power up). When this event occurs, this equipment saves the related Load Port data to the current Load Port Data Variables.
5102	`AccessSMGoAuto` Transition from `MANUAL` to `AUTO` access mode. When this event occurs, this equipment saves the related Load Port data to the current Load Port Data Variables.
5103	`AccessSMGoManual` Transition from `AUTO` to `MANUAL` access mode. When this event occurs, this equipment saves the related Load Port data to the current Load Port Data Variables.

GEM-related Material Movement Events

The following events indicate material movement as required by SEMI E30 GEM.

CEID	Name and description
9	`GemMaterialReceivedEvent` This GEM-required event indicates that a carrier has been loaded on to the equipment. When this event occurs, this equipment saves the related Load Port data to the current Load Port Data Variables.
10	`GemMaterialRemovedEvent` This GEM-required event indicates that a carrier has been unloaded from the equipment. When this event occurs, this equipment saves the related carrier and Load Port data to the current Load Port and current Carrier Data Variables.

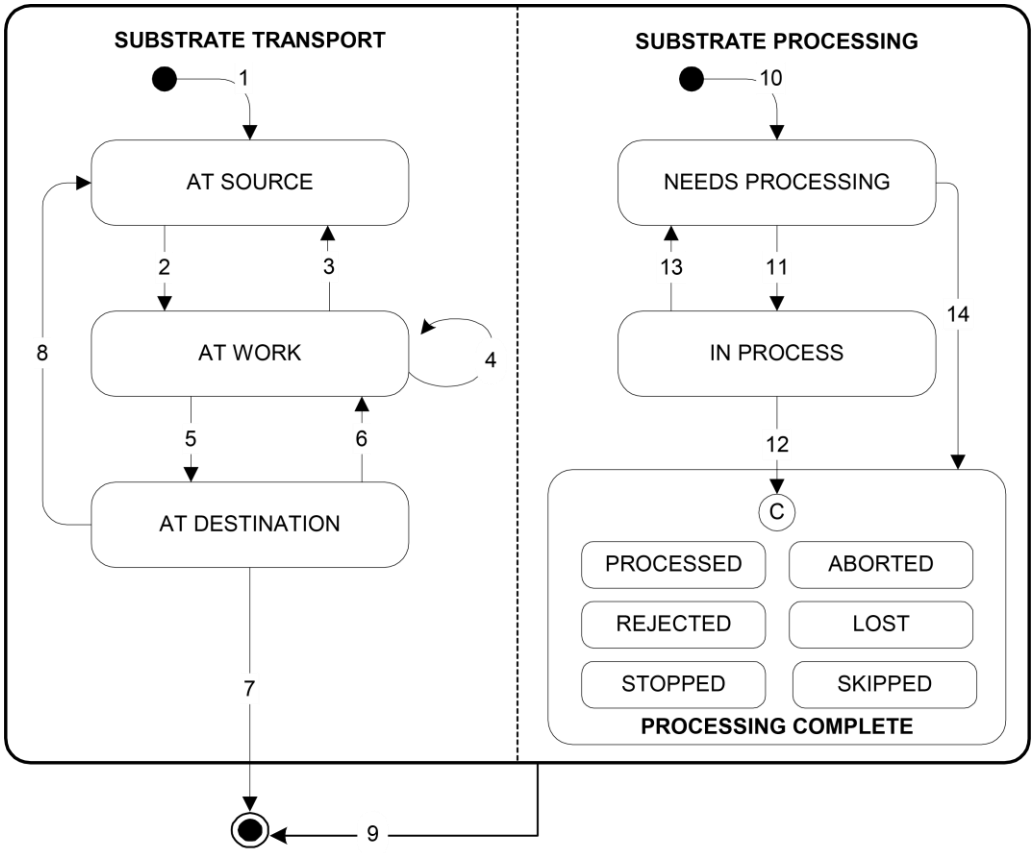
SEMI E90 Substrate Management Events

This section describes collection events related to SEMI E90 Substrate Management standard.

Substrate State Model

The following figure shows a Substrate State Model. The following sections show Events for this model.

Figure 3: Substrate State Model



For more information, see Substrate Transfer State Model Transition Events (on page 3-15) and Substrate Location State Model Transition Events (on page 3-17).

Substrate Transfer State Model Transition Events

The following events relate to SEMI E90 substrate Transfer State Model transitions. See the Substrate State Model (on page 3-14) at the end of this section for more information.

CEID	Name and description
5201	SubstSMTrans01 Substrate Transfer Transition #1 has occurred. The Substrate Object transits from no state to AT SOURCE state. The Substrate Object is created. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5202	SubstSMTrans02 Substrate Transfer Transition #2 has occurred. The Substrate Object transits from AT SOURCE state to AT WORK state. The Substrate Object transits from the current Substrate Location into the Equipment Substrate Location. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5203	SubstSMTrans03 Substrate Transfer Transition #3 has occurred. The Substrate Object transits from AT WORK state to AT SOURCE state. The Substrate Object transits from the current Equipment Substrate Location to another Equipment Substrate Location. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5204	SubstSMTrans04 Substrate Transfer Transition #4 has occurred. Substrate Object transits from AT WORK state to AT WORK state. The Substrate Object transits from the current Equipment Substrate Location to another Equipment Substrate Location. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5205	SubstSMTrans05 Substrate Transfer Transition #5 has occurred. The Substrate Object transits from AT WORK state to AT DESTINATION state. The Substrate Object transits from the current Equipment Substrate Location to the destination Substrate Location. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5206	SubstSMTrans06 Substrate Transfer Transition #6 has occurred. The Substrate Object transits from AT DESTINATION state to AT WORK state. The Substrate Object transits from the destination Substrate Location back to the Equipment Substrate Location. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.

CEID	Name and description
5207	SubstSMTrans07 Substrate Transfer Transition #7 has occurred. The Substrate Object transits from AT DESTINATION state to extinction. The Substrate Object is removed from the equipment. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5208	SubstSMTrans08 Substrate Transfer Transition #8 has occurred. The Substrate Object transits from AT DESTINATION state to AT SOURCE state. The operator or the equipment acknowledges that Substrate Object is currently at the source Location. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5209	SubstSMTrans09 Substrate Transfer Transition #9 has occurred. The Substrate Object transits from any SUBSTRATE sub-state to extinction. The operator or the equipment acknowledges that Substrate Object has been removed. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5210	SubstSMTrans10 Substrate Transfer Transition #10 has occurred. The Substrate Object transits from no state to the NEEDS PROCESSING state. The Substrate Object is instantiated. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5211	SubstSMTrans11 Substrate Transfer Transition #11 has occurred. The Substrate Object transits from the NEEDS PROCESSSING state to IN PROCESS. The Substrate Object processing operation starts. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5212	SubstSMTrans12 Substrate Transfer Transition #12 has occurred. The Substrate Object transits from the IN PROCESS state to PROCESSING COMPLETE. The Substrate Object processing operation completes. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.

CEID	Name and description
5213	SubstSMTrans13 Substrate Transfer Transition #13 has occurred. The Substrate Object transits from the IN PROCESS state to NEEDS PROCESSING. The Substrate Object begins another processing operation. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.
5214	SubstSMTrans14 Substrate Transfer Transition #14 has occurred. The Substrate Object transits from NEEDS PROCESSING to PROCESSING COMPLETE. When this event occurs, this equipment saves the related Substrate data to the corresponding current Data Variables.

Substrate Location State Model Transition Events

The following events relate to SEMI E90 Substrate Location State Model Transitions. See the Substrate state model (on page 3-14) at the end of this section for more information.

CEID	Name and Description
5221	SubstLocSMTrans01 Substrate Location transition #1 has occurred. The Substrate Location object transits from UNOCCUPIED to OCCUPIED. When this event occurs, this equipment saves the related Substrate Location data to the corresponding current Data Variables.
5222	SubstLocSMTrans02 Substrate Location transition #2 has occurred. The Substrate Location object transits from OCCUPIED to UNOCCUPIED. When this event occurs, this equipment saves the related Substrate Location data to the corresponding current Data Variables.

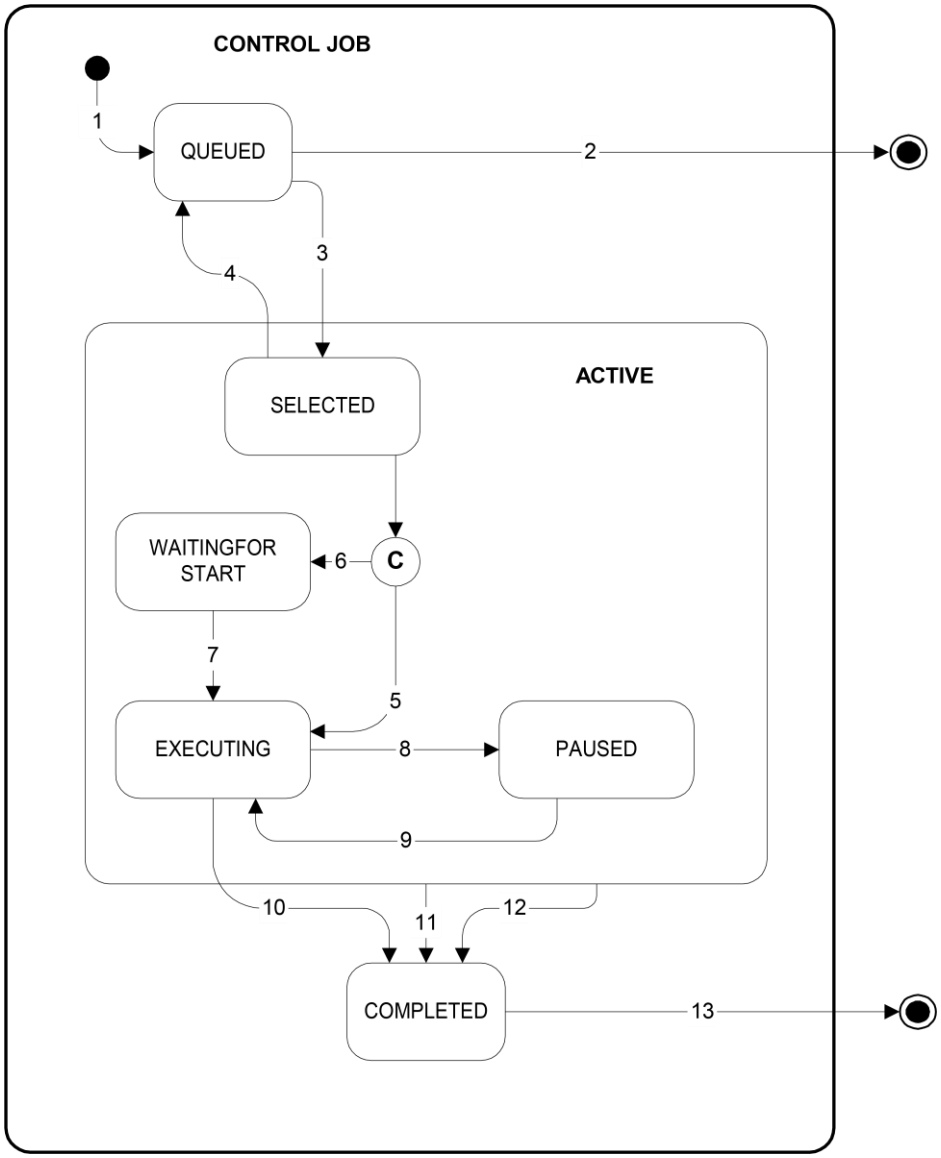
SEMI E94 Control Job Management Events

This section describes collection events related to the SEMI E94 Control Job Management standard.

Control Job State Model

The following figure shows the Control Job State Model. The following section shows Transition Events for this model.

Figure 4: Control Job State Model



Control Job State Transition Events

The following events indicate SEMI E94 control job state transitions. The current Control Job Data Variables show the attributes of the related Control Job. See the Control Job State Model (on page 3-18) at the end of this section.

CEID	Name and description
5401	`CtrlJobSMTrans01` SEMI E94 Control Job State Model Transition #1 has occurred. The CtrlJob object is instantiated and enters `QUEUED` state. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5402	`CtrlJobSMTrans02` SEMI E94 Control Job State Model Transition #2 has occurred. In response to a host `S16F27 CJAbort`, `CJCancel`, or `CjStop` (or equivalent local operator command), the CtrlJob transits from `QUEUED` to termination. The CtrlJob object will be destroyed. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5403	`CtrlJobSMTrans03` SEMI E94 Control Job State Model Transition #3 has occurred. The CtrlJob transits from `QUEUED` (Head of Queue) to `SELECTED`. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5404	`CtrlJobSMTrans04` SEMI E94 Control Job State Model Transition #4 has occurred. In response to a host `S16F27 CjDeselect` (or equivalent local operator command), the CtrlJob transits from `SELECTED` to `QUEUED` (Head of Queue). If another CtrlJob was at Head of Queue, it will take Control Job State Model Transition #3. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5405	`CtrlJobSMTrans05` SEMI E94 Control Job State Model Transition #5 has occurred. The CtrlJob transits from `SELECTED` to `EXECUTING`. The CtrlJob start method specified Auto. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5406	`CtrlJobSMTrans06` SEMI E94 Control Job State Model Transition #6 has occurred. The CtrlJob transits from `SELECTED` to `WAITING FOR START`. The CtrlJob start method specified User Start. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.

CEID	Name and description
5407	CtrlJobSMTrans07 SEMI E94 Control Job State Model Transition #7 has occurred. In response to a host S16F27 CjStart (on page 7-75) (or equivalent local operator command), the CtrlJob transits from WAITING FOR START to EXECUTING. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5408	CtrlJobSMTrans08 SEMI E94 Control Job State Model Transition #8 has occurred. In response to a host S16F27 CjPause (on page 7-75) (or equivalent local operator command), the CtrlJob transits from EXECUTING to PAUSED. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5409	CtrlJobSMTrans09 SEMI E94 Control Job State Model Transition #9 has occurred. In response to a host S16F27 CjResume (on page 7-76) (or equivalent local operator command), the CtrlJob transits from PAUSED to EXECUTING. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5410	CtrlJobSMTrans10 SEMI E94 Control Job State Model Transition #10 has occurred. The CtrlJob has completed normally and transits from EXECUTING to COMPLETED. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5411	CtrlJobSMTrans11 SEMI E94 Control Job State Model Transition #11 has occurred. In response to a S16F27 CjStop (on page 7-78) (or equivalent local operator command), the CtrlJob transits from ACTIVE to COMPLETED. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5412	CtrlJobSMTrans12 SEMI E94 Control Job State Model Transition #12 has occurred. In response to a host S16F27 CjAbort (on page 7-79) (or equivalent local operator command), the CtrlJob transits from ACTIVE to COMPLETED. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.

CEID	Name and description
5413	`CtrlJobSMTrans13` SEMI E94 Control Job State Model Transition #13 has occurred. A completed CtrlJob, which has been stored in non-volatile memory for temporary retention, is now destroyed. The CtrlJob transits from `COMPLETED` to termination and the CtrlJob object is destroyed. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5420	`SelectedCjSetEmptied` An event indicating the selection of the last Control Job. This event is sent when the last `SELECTED` Control Job starts to execute, and no other control jobs are selected. This event is sent simultaneously to the ECS and the host. When received by the ECS, this event provides additional input when deciding to allow more control jobs to be selected. When received by the host, this event provides information of changes initiated from a source other than the host, such as a local operator. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.
5421	`CjHOQCompleted` An event indicating the completion of a CJHOQ (Control Job Head of Queue) service. This event is sent each time a CJHOQ service is completed successfully. This event is sent simultaneously to the ECS and the host (as with any other event sent by ConX300). When received by the ECS, this event provides additional input when deciding to allow more control jobs to be selected. When received by the host, this event provides information of changes initiated from a source other than the host, such as a local operator. This event is important to the ECS, since there is no other way for the ECS to know about reordering events happening in the control job queue. When this event occurs, this equipment saves the related Control Job data to the corresponding current Data Variables.

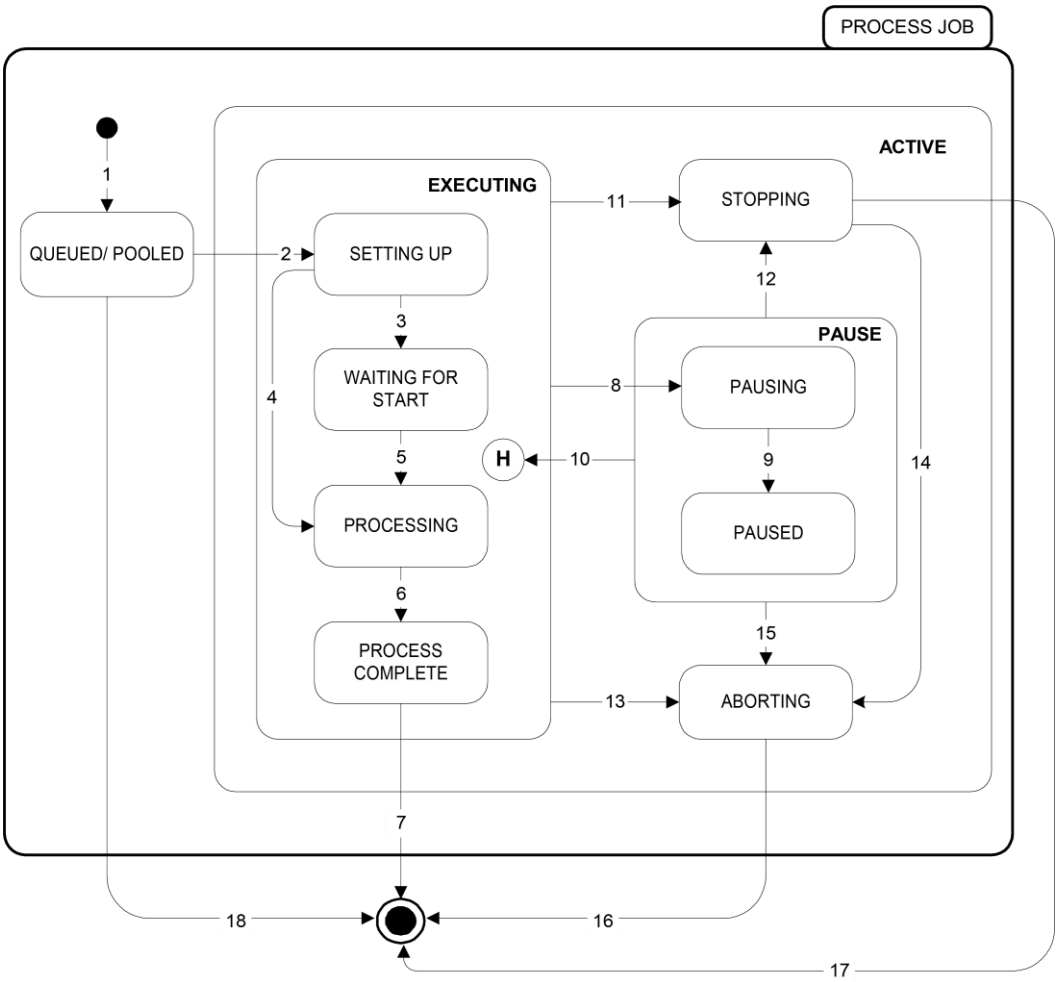
SEMI E40 Process Job Management Events

This section describes collection events related to SEMI E40 Process Job Management standard.

Process Job State Model

The following figure shows the Process Job State Model. The following sections show Events for this model.

Figure 5: Process Job State Model



Process Job State Transition Events

The following events indicate SEMI E40 Process Job State Transitions. The Current Process Job Data Variables show the attributes of the related Process Job. See the Process job state model (on page 3-21) at the end of this topic.

CEID	Name and description
5301	PrJobSMTrans01 SEMI E40 Process Job State Model Transition #1 has occurred. The PrJob object is instantiated and enters QUEUED/POOLED state. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5302	PrJobSMTrans02 SEMI E40 Process Job State Model Transition #2 has occurred. The PrJob transits from QUEUED/POOLED to SETTING UP state. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5303	PrJobSMTrans03 SEMI E40 Process Job State Model Transition #3 has occurred. The PrJob transits from SETTING UP state to WAITING FOR START state, because the PrJob specified MANUAL START. A host S16F5 start command (or equivalent local operator command) is required. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5304	PrJobSMTrans04 SEMI E40 Process Job State Model Transition #4 has occurred. The PrJob transits from SETTING UP state to PROCESSING state, because the PrJob specified AUTOMATIC START. When this event occurs, this equipment saves the related PrJob and Control Job data to the corresponding current Data Variables.
5305	PrJobSMTrans05 SEMI E40 Process Job State Model Transition #5 has occurred. In response to a S16F5 Start (on page 7-55) (or equivalent local operator command), the PrJob transits from WAITING FOR START to PROCESSING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5306	PrJobSMTrans06 SEMI E40 Process Job State Model Transition #6 has occurred. The PrJob has completed processing normally and transits from PROCESSING to PROCESS COMPLETE. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.

CEID	Name and description
5307	PrJobSMTrans07 SEMI E40 Process Job State Model Transition #7 has occurred. The PrJob has completed all post-processing normally and transits from PROCESS COMPLETE to termination. The PrJob object will be destroyed. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5308	PrJobSMTrans08 SEMI E40 Process Job State Model Transition #8 has occurred. In response to a host S16F5 Pause (on page 7-54) (or equivalent local operator command), the PrJob transits from EXECUTING to PAUSING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5309	PrJobSMTrans09 SEMI E40 Process Job State Model Transition #9 has occurred. The PrJob has completed pausing and transits from PAUSING to PAUSED state. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5310	PrJobSMTrans10 SEMI E40 Process Job State Model Transition #10 has occurred. In response to a S16F5 Resume (on page 7-54) (or equivalent local operator command), the PrJob transits from PAUSE to the EXECUTING sub-state from which the PrJob was paused earlier. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5311	PrJobSMTrans11 SEMI E40 Process Job State Model Transition #11 has occurred. In response to a S16F5 Stop (on page 7-55) (or equivalent local operator command), the PrJob transits from EXECUTING to STOPPING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5312	PrJobSMTrans12 SEMI E40 Process Job State Model Transition #12 has occurred. In response to a S16F5 Stop (on page 7-55) (or equivalent local operator command), the PrJob transits from PAUSE to STOPPING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.

CEID	Name and description
5313	PrJobSMTrans13 SEMI E40 Process Job State Model Transition #13 has occurred. In response to a S16F5 Abort (on page 7-53) (or equivalent local operator command), the PrJob transits from EXECUTING to ABORTING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5314	PrJobSMTrans14 SEMI E40 Process Job State Model Transition #14 has occurred. In response to a S16F5 Abort (on page 7-53) (or equivalent local operator command), the PrJob transits from STOPPING to ABORTING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5315	PrJobSMTrans15 SEMI E40 Process Job State Model Transition #15 has occurred. In response to a S16F5 Abort (on page 7-53) (or equivalent local operator command), the PrJob transits from PAUSE to ABORTING. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5316	PrJobSMTrans16 SEMI E40 Process Job State Model Transition #16 has occurred. The PrJob has completed aborting and transits from ABORTING to termination. The PrJob object will be destroyed. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5317	PrJobSMTrans17 SEMI E40 Process Job State Model Transition #17 has occurred. The PrJob has completed stopping and transits from STOPPING to termination. The PrJob object will be destroyed. When this event occurs, this equipment saves the related Process Job and Control Job data to the corresponding current Data Variables.
5318	PrJobSMTrans18 SEMI E40 Process Job State Model Transition #18 has occurred. In response to a S16F5 Abort, Cancel, or Stop (or equivalent local operator commands), the PrJob transits from QUEUED/POOLED to termination. The PrJob object will be destroyed. When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.

E30-style Process Job Collection Events

These collection events support PR Job Alerts using E30-style collection events.

CEID	Name and description
5321	`PRJobSetup` A transition of `PRJobSMTrans02` of the Process Job State Model (on page 3-21). When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.
5322	`PRJobProcessing` A transition of `PRJobSMTrans04` or `PRJobSMTrans05` of the Process Job State Model (on page 3-21). When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.
5323	`PRJobProcessingComplete` A transition of `PRJobSMTrans06` of the Process Job State Model (on page 3-21). When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.
5324	`PRJobComplete` A transition of `PRJobSMTrans07`, `PRJobSMTrans16`, `PRJobSMTrans17`, or `PRJobSMTrans18` of the Process Job State Model (on page 3-21). When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.
5325	`PRJobWaitingForStart` A transition of `PRJobSMTrans03` of the Process job state model (on page 3-21). When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.
5326	`PRJobWaitingForMaterial` An event sent to the host in response to `GemPRJobWaitingForMaterial`, indicating that the subject Process Job cannot start due to missing material. When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.
5327	`PRJobStateChange` An event indicating any transition in the Process Job State Model. When this event occurs, ConX300 saves the related Process Job and Control Job data to the corresponding current Data Variables.

SEMI E30 GEM

This section describes collection events related to SEMI E30 GEM standard and other collection events supported by the equipment

State diagrams

This section uses Finite State Process Model diagrams to describe the SECS link condition and process cycle. Each Finite State Process Model includes a State Diagram and a description of the states and state transitions.

The State Diagrams have been prepared as mandated by the Generic Equipment Model (GEM) SEMI E30-0298 specification. The format for these use the Harel Statechart notation developed by David Harel.

States are represented by a rectangle with rounded corners. A state transition is shown with a line from the old state and ending with the arrow symbol at the new state. Transitions are unidirectional.

States may be divided into substates to facilitate more concise definition of behavior. Substates must be one of two types:

- `AND` substates
- `OR` substates

A parent may be divided into two or more `OR` substates, but only one is the active substate at any time. For example, a motor state named `FUNCTIONAL` may be either `ON` or `OFF` but never both.

Another way of dividing a parent state corresponds roughly with subsystems. These `AND` substates represent parallelism, such that every `AND` substate of an active parent is considered active.

The default entry point symbol, represented by a filled circle, indicates which `OR` state is initially active when there is not an explicit choice.

An entrance to a state ending in a history symbol, represented by a circle with H, indicates that the `OR` substate, to be entered, should be the same as the substate that was active the last time the parent state was active. The H symbol refers to the choice of substates for the parent. The H symbol extends further to the lowest defined substate. If the last time is unknown, the default entry is used.

The selector, represented by a circle with S, and conditional selector, represented by a circle with C, are symbols used to abbreviate complex entrances to states. Their meaning is similar and indicates that choosing an OR substate upon entry of a parent state depends on a condition that is not shown. The selector is used to combine several similar transition events while the conditional selector will typically require a test of conditions that are external to the stimulus for state transition.

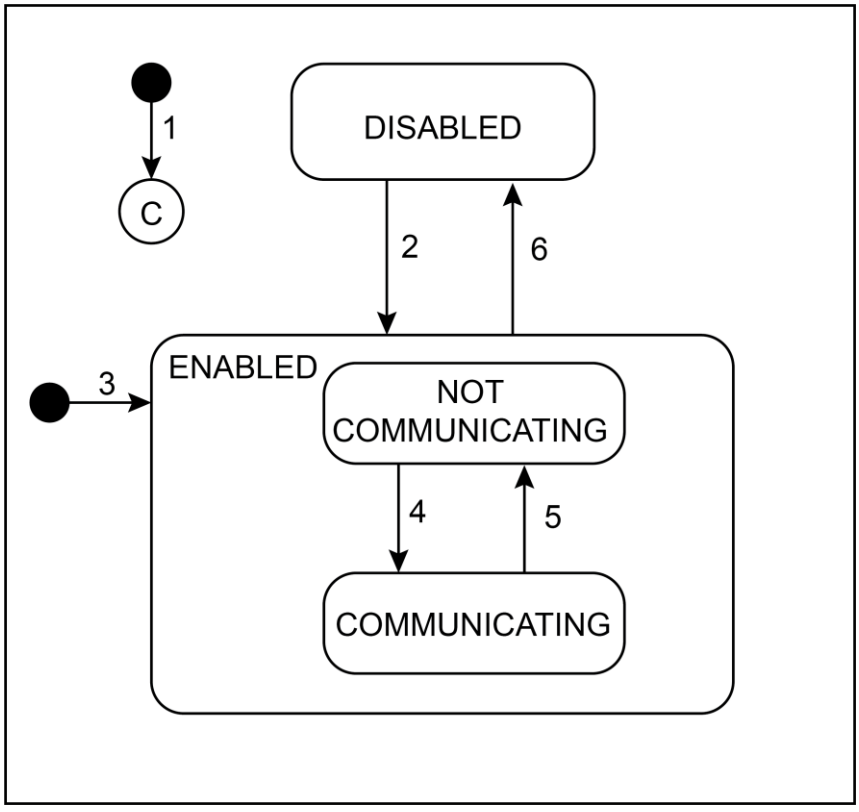
NOTE

For 300mm State Diagrams, see the *KIGEM Automation Reference Manual* (document number KIGEM-901-01).

Communications State Model

The following figure shows the Communications State Model. The following sections show the definitions and Events for this model.

Figure 6: Communications State diagram



Communications State definitions

The Communications State is shown in KIDS in the Comm Status field. The communication states are:

- DISABLED - All SECS communication is disabled at the equipment. The equipment will not send any messages or an ENQ to the Host, and it will not respond to any messages or ENQ sent from the Host.
- ENABLED - The equipment can communicate with the Host. The ENABLED state has the following substates:
  - NOT COMMUNICATING
    - SECS II communications between the Host and equipment are possible but have not been established. The equipment sends an S1F13 (Establish Communications Request) message periodically until the Host responds or until the operator switches to the DISABLED state. The time period between S1F13 messages is determined by the EstablishCommunicationsTimeout Equipment Constant and can range from 0 to 1800 seconds. The default value is 20 seconds. Once the Host has responded with an S1F14 (Establish Communications Acknowledge) message, the equipment transitions to the COMMUNICATING state.
    - The Host can attempt to initiate communications by sending an S1F13. When the equipment is in the NOT COMMUNICATING state, it will respond to the S1F13 with an S1F14 and change to the COMMUNICATING state.
    - The equipment will always respond to an S1F13 when in the ENABLED state. However, it will not send an S1F13 once communications have been established. When in the NOT COMMUNICATING state, the equipment will not reject messages from the Host but will ignore any message except S1F13 or S1F14.
  - COMMUNICATING
    - The SECS link between the equipment and the Host is operating without restrictions. When in the COMMUNICATING state, heartbeat messages (S1F1) will be sent periodically by the equipment.
    - The Heartbeat frequency is controlled by the Heartbeat Equipment Constant. The value of the Heartbeat can range from 0 to 1800 seconds with a default of 30 seconds.

Communications State Transition Events

The following are the transitions for the communications states listed in the previous section.

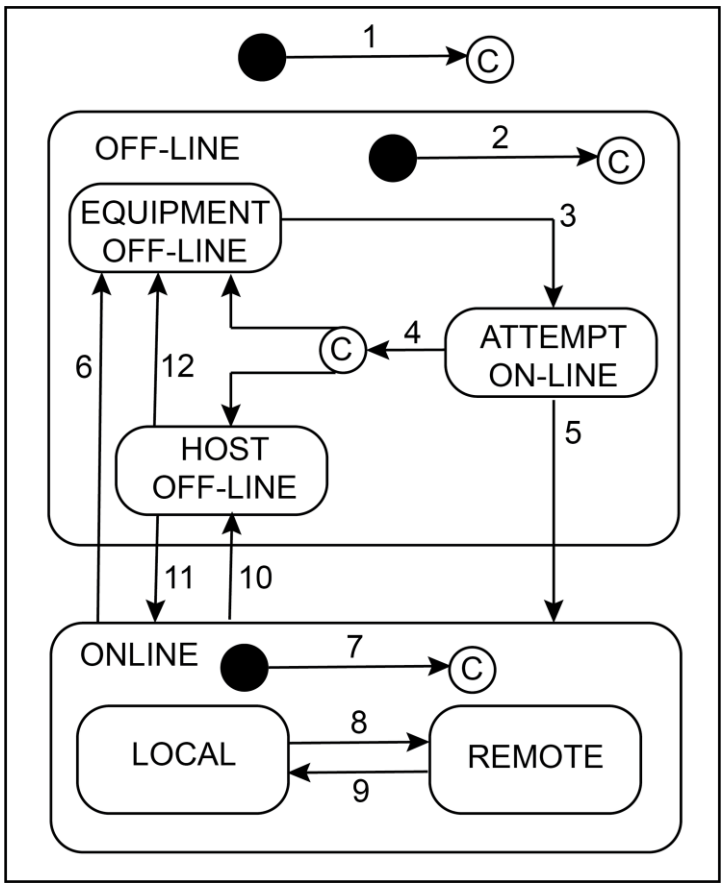
Communications State Transition Events

#	State transition	Description
1	Initial entry	The system may be configured to enter the ENABLED or DISABLED states on initialization. The initial state is determined by the InitCommState Equipment Constant. A value of 0 causes the initial state to be DISABLED and a value of 1 indicates an initial state of ENABLED.
2	DISABLED to ENABLED	This transition occurs when the operator selects Enable in KIDS.
3	Entry to ENABLED, NOT COMMUNICATING	Any entry to the ENABLED state automatically goes to the NOT COMMUNICATING substate. This transition causes the equipment to begin watching for and sending the S1F13 (Establish Communication Request) message.
4	NOT COMMUNICATING to COMMUNICATING	Upon successful exchange of S1F13/F14 messages with the Host, the system enters the COMMUNICATING substate. Note that either the Host or the equipment may initiate the S1F13/F14 exchange.
5	COMMUNICATING to NOT COMMUNICATING	If communications with the Host are disrupted for any reason, the system transitions to the NOT COMMUNICATING substate. From this state, the equipment attempts to reestablish communications with the Host.
6	ENABLED to DISABLED	This transition occurs only when the operator selects Disable in KIDS.

Control State Model

The following events are implemented to support SEMI E30 GEM.

Figure 7: Control State Model



Control State definitions

The current Control State is displayed in KIDS in the Control Status field.

OFF-LINE substates

When the equipment is `OFF-LINE`, it is controllable in KIDS. The SECS link is restricted. The equipment does not send primary SECS messages and refuses primary SECS messages from the host except for online and connection-related messages.

The possible OFF-LINE substates are:

- OFF-LINE, EQUIPMENT OFF-LINE
  - When the equipment is in this substate, the operator is required to take the equipment online. The only primary message that the equipment will send in this state is an S1F13 (Connect Request) if the operator switches to the ON-LINE state. If the Host sends an S1F13, the equipment will reply with an S1F14. If the Host sends an S1F17 (Online Request), the equipment will respond with an S1F18 (Online Request Acknowledge) with an ONLACK code of 1 (Online Not Allowed). If the Host sends any other primary message, the equipment responds with SxF0.
- OFF-LINE, ATTEMPT ON-LINE
  - This substate indicates that the equipment is trying to change from OFF-LINE to ON-LINE. The equipment sends an S1F1 to request permission from the Host to go online.
- OFF-LINE, HOST OFF-LINE
  - In this substate, the equipment is ready to go online but is waiting for the Host to request it. If the Host sends an S1F17 (Online Request), the equipment replies with S1F18 (Online Request Acknowledge) with an ONLACK code of 0 (Online Accepted). If the Host sends an S1F13 (Connect Request) message, the equipment responds with an S1F14 (Connect Request Acknowledge) message. The equipment refuses any other primary message from the Host by sending an SxF0 message.

ON-LINE substates

In the ON-LINE state, the SECS link operates with minimal restrictions. When ON-LINE, the equipment may periodically send S1F1 (Are You There) messages as well as S1F13 (Connect Request) messages. The equipment should never refuse a primary message from the Host with an SxF0 reply when online.

The equipment will respond to S1F13 messages from the Host with an S1F14 reply. If the Host sends an S1F15 (Request Offline), the equipment will send an S1F16 (Offline Acknowledge) in reply and transit to the HOST OFF-LINE substate. If the Host sends an S1F17 (Online Request) while the equipment is in the ON-LINE State, the equipment will reply with S1F18 (Online Request Acknowledge) with an ONLACK code of 2 (Equipment Already Online).

The ON-LINE substates are:

- ON-LINE, LOCAL
  - When the equipment is in the LOCAL substate of ON-LINE, the operator has control over the equipment through the equipment console. The equipment rejects remote commands from the Host (S2F41 messages) by responding with an S2F42 (Host Command Acknowledge) and with an HCACK code of 2 (Command cannot be executed now). The Host has access to all Discrete Variables, Status Variables, and Equipment Constants when the equipment is in the LOCAL substate. Collection events and alarms are generated as normal.
- ON-LINE, REMOTE
  - When the equipment is in the REMOTE substate of ON-LINE, the Host has control over the equipment using remote commands. Remote commands are sent to the equipment with the S2F41 (Host Command Send) message. The Host can fully operate the equipment. The operator is restricted from testing in the REMOTE substate. If the processing state is idle, the operator may switch from REMOTE to LOCAL.

Control State Events

The following events are implemented to support SEMI E30 GEM.

#	Name and description	Suggested data
2	GemControlStateLOCAL When the control state changes to ONLINE LOCAL.	-
3	GemControlStateREMOTE When the control state changes to ONLINE REMOTE.	-
4	GemEquipmentOFFLINE When the control state changes to OFFLINE.	-

Control State Transitions

The following are the transitions for the Control States listed in the previous section.

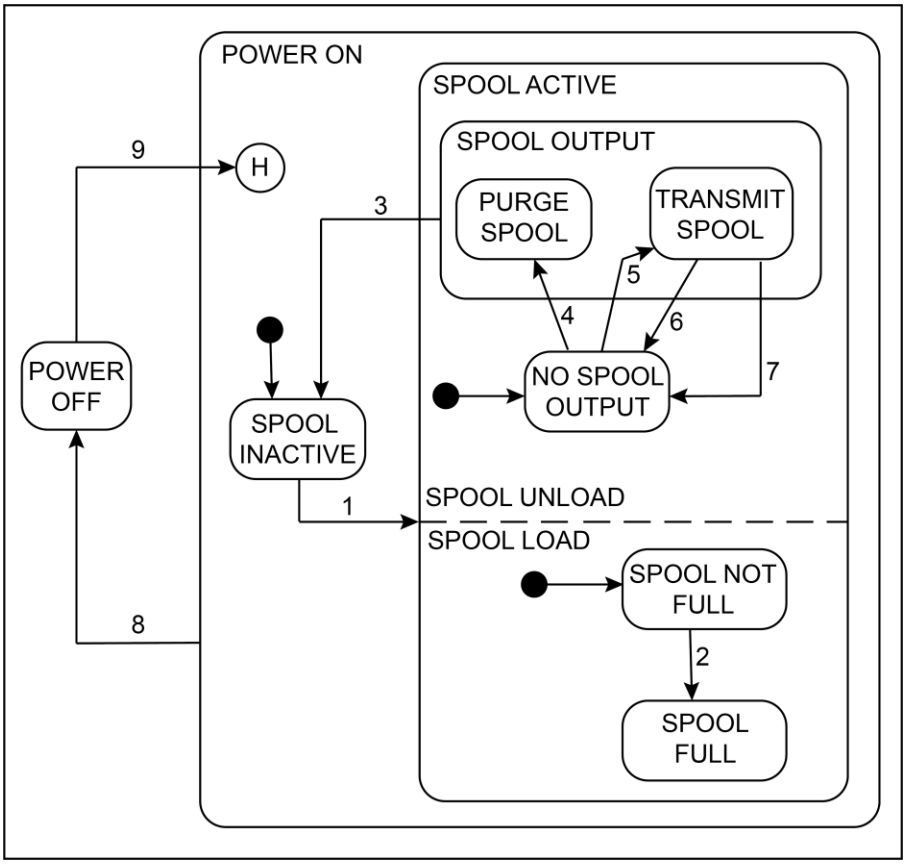
#	State transition	Description
1	Initial Entry	The equipment can be configured to enter any of the five substates upon starting. Use InitControlState, OfflineSubState, and OnlineSubState Equipment Constants to configure this transition.
2	Entry to OFF-LINE	This transition occurs if the InitControlState Equipment Constant is set to enter the OFF-LINE state. The substate that you enter depends on the value of the OfflineSubState Equipment Constant.
3	EQUIPMENT OFF-LINE to ATTEMPT ON-LINE	This transition is triggered by the operator selecting Go Online in KIDS. The equipment sends an S1F1 (Are You There) message to ask the Host permission to go ON-LINE.
4	Exit from ATTEMPT ON-LINE	The transition occurs when the Host rejects the S1F1 message from the equipment or if the transaction could not be completed for another reason. You can configure the destination state with the OnlineFailed Equipment Constant. If the destination state is HOST OFF-LINE, then the Host can put the equipment online when it is ready. If the destination state is EQUIPMENT OFF-LINE, operator action is required, in KIDS to put the equipment online. The Host cannot command the equipment to go online.
5	ATTEMPT ON-LINE to ON-LINE	If the Host accepts the request from the equipment to go online (S1F1) with a S1F2 message, the equipment transitions to the online state. The actual destination substate (LOCAL or REMOTE) is configurable with the OnlineSubState Equipment Constant. If the destination substate is LOCAL, the GemControlStateLOCAL event is sent to the Host. If the destination substate is REMOTE, the GemControlStateREMOTE event is sent to the Host. In both cases, the PreviousControlState Status Variable is set to 2 (OFF-LINE, ATTEMPT ON-LINE).
6	ON-LINE to EQUIPMENT OFF-LINE	From either the LOCAL or REMOTE substates, the operator can switch the equipment to the OFF-LINE state through KIDS. The equipment sends the GemEquipmentOffline event, enters the EQUIPMENT OFF-LINE substate, and updates the value of the PreviousControlState Status Variable as appropriate.
7	Entry to ON-LINE	The ON-LINE state can be entered from system initialization, ATTEMPT ON-LINE or HOST OFF-LINE. The substate entered on entry to ON-LINE is determined by the OnlineSubState Equipment Constant. On transition to the ON-LINE state, the GemControlStateREMOTE or GemControlStateLOCAL event is generated and the PreviousControlState Status Variable is updated.
8	LOCAL to REMOTE	When the equipment is ON-LINE and in the LOCAL substate, the operator can place the equipment in the REMOTE substate from KIDS. Upon the transition to REMOTE, the GemControlStateREMOTE event occurs, and the value of the PreviousControlState is updated.
9	REMOTE to LOCAL	When the equipment is ON-LINE and in the REMOTE substate, the operator can place the equipment in the LOCAL substate from KIDS. Upon the transition to LOCAL, the GemControlStateLOCAL event occurs and the value of the PreviousControlState is updated.

#	State transition	Description
10	ON-LINE to HOST OFF-LINE	When the equipment is ON-LINE, the Host can request that it go offline by sending an S1F15 (Request Offline). The equipment responds with an S1F16 (Request Offline Acknowledge) with OFLACK set to 0 (Normal). The control state transitions to the HOST OFF-LINE substate, the GemEquipmentOffline event occurs, and the PreviousControlState is updated.
11	HOST OFF-LINE to ON-LINE	When the equipment is in the HOST OFF-LINE substate, the Host can request that it go online by sending an S1F17 (Request Online) message. The equipment replies with S1F18 (Online Acknowledge) message with ONLACK set to 0 (Online Accepted).
12	HOST OFF-LINE to EQUIPMENT OFF-LINE	This transition occurs when the operator selects Go Offline in KIDS. This prevents the Host from taking the equipment online. The GemEquipmentOffline event occurs and the PreviousControlState is updated.

Spooling State Model

The following figure shows the Spooling State Model. The following sections show definitions, Events, and Transitions for this model.

Figure 8: Spooling State Model



Spooling State definitions

The current Spooling State is displayed in KIDS in the Spool Status field.

The possible spooling states are:

- POWER OFF
  - In this state, the system is not functioning in any way.
- POWER ON
  - In this state, the system is functioning. Note that when the POWER ON state begins, the system returns to its last state. This means that if spooling was active before the last power cycle, spooling will continue when the power is turned back on. Power cycling is not enough to stop spooling. The only way to stop spooling is for the Host to request that the spool be sent or purged, an S6F23 message, or to disable spooling by setting the ConfigSpool Equipment Constant to 0.
- SPOOL INACTIVE
  - Under normal conditions, the equipment is in the SPOOL INACTIVE state. In this state, SECS communications are normal, the spool is empty, and no messages are added to the spool.
- SPOOL ACTIVE
  - The equipment enters the SPOOL ACTIVE state whenever it has detected a communication failure. In this state, all primary spooling messages that have been enabled (with S2F43 messages) are directed to the spooling system. Once the SPOOL ACTIVE state has been entered, the Host must unload or purge the spool with a S6F23 message to restore normal operation. When you reset the equipment, it will not stop spooling. Secondary messages, such as responses to requests originated by the Host, are sent when possible. If they cannot be sent, they are discarded.
  - The SPOOL ACTIVE state has two AND-type state machines, SPOOL LOAD and SPOOL UNLOAD, running simultaneously. This means that the spool can be loaded and unloaded at the same time. The SpoolStartTime Status Variable is set on entry to the SPOOL ACTIVE state

Spool load

The SPOOL LOAD state machine is responsible for moving messages into the spool area.

The SpoolLoadSubState Status Variable is maintained in this state and contains one of the following substates:

- SPOOL NOT FULL
  - This is the default entry state for the SPOOL LOAD state machine. In this state, primary SECS messages are written to the spool file. The SpoolCountTotal and SpoolCountActual Status Variables are incremented as messages and added to the spool.
- SPOOL FULL
  - This state is entered when the spool file is full. The system behavior in this state is determined by the value of the OverWriteSpool Equipment Constant. If OverWriteSpool is set to TRUE, the oldest messages in the spool file are deleted as new messages are spooled. In this state, the SpoolCountTotal Status Variable is incremented each time a message is added to the spool. The SpoolCountActual Status Variable is maintained to show the actual number of messages currently in the spool.
  - If OverWriteSpool is set to FALSE, then any messages sent for spooling when the spool is full are discarded. When these messages are discarded, SpoolCountTotal is incremented, but SpoolCountActual does not change.
  - The SpoolFullTime Status Variable is set on entry to the SPOOL FULL state.

Spool unload

The SPOOL UNLOAD state machine is responsible for moving messages out of the spool area.

The SpoolUnloadSubState Status Variable is maintained in this state machine and contains one of the following substates:

- NO SPOOL OUTPUT
  - In this state, no messages are removed from the spool. This is the default entry state for the SPOOL UNLOAD state machine.
- SPOOL OUTPUT
  - In this state, messages are removed from the spool. When a message is removed from the spool, it is either discarded or sent to the Host.
- TRANSMIT SPOOL
  - In this state, messages are removed from the spool and sent to the Host. The messages are sent in FIFO order (oldest first). As each message is sent to the Host, it is removed from the spool, and the SpoolCountActual variable is decremented. If the message cannot be sent to the Host, it remains in the spool. Messages are sent until either the spool is empty, the maximum number of messages as specified by the MaxSpoolTransmit Equipment Constant have been sent, or a communication failure prevents a message from being sent.
- PURGE SPOOL
  - In the PURGE SPOOL state, all messages are discarded from the spool and are not sent to the Host. When the spool is empty, the SpoolCountActual Status Variable is 0.

Spooling State Events

The following table shows the Events for the Spooling State Model.

#	Name and description	Suggested data
6	GemSpoolingActivated Indicates that spooling has been activated and messages are being spooled.	SpoolStartTime
7	GemSpoolingDeactivated Indicates that the entire spool has been transmitted or purged and messages are no longer being spooled.	-
8	GemSpoolTransmitFailure Indicates that a spooled message could not be transmitted.	-

Spooling State Transitions

The following are the transitions for the spooling states listed in the previous section.

#	State transition	Description
1	SPOOL INACTIVE to SPOOL ACTIVE	This transition occurs whenever spooling is enabled (example: the ConfigSpool Equipment Constant has a value of 1) and a communication failure is detected. Typically, a communication failure is indicated when the RTY count exceeds its limit. The following actions take place on this transition: ■ SpoolCountActual and SpoolCountTotal are initialized to zero. ■ Any open transactions with the Host are aborted. ■ SpoolStartTime is initialized to the current date and time. ■ SpoolUnloadSubState is initialized to NoSpoolOutput. ■ SpoolLoadSubState is initialized to SpoolNotFull. ■ SpoolState transits to SpoolActive. ■ The event GemSpoolingActivated is signaled. If this CEID is enabled and the Host has selected the event message as spoolable, this event will be the first message written to the Spool File.
2	SPOOL NOT FULL to SPOOL FULL	When the spool file has reached its maximum size, as specified in the MaxSpoolFileSize Private Equipment Constant, the SPOOL LOAD State Process Model transitions to the SPOOL FULL state. The SpoolFullTime Status Variable is set to the current time.
3	SPOOL OUTPUT to SPOOL INACTIVE	This transition occurs whenever the spool has become empty due to all the spooled messages being sent or purged. The GemSpoolingDeactivated event occurs.
4	NO SPOOL OUTPUT to PURGE SPOOL	This transition occurs whenever the Host sends an S6F23 (Request Spooled Data) message with and RSDC code of 1 (Purge spool). The SpoolUnloadSubState is set to 3 (Purge spool) and the equipment begins deleting messages from the spool file.
5	NO SPOOL OUTPUT to TRANSMIT SPOOL	This transition occurs whenever the Host sends an S6F23 (Request Spooled Data) message with and RSDC code of 0 (Transmit spool). The SpoolUnloadSubState is set to 4 (transmit spool) and the equipment begins sending messages from the spool file to the Host.
6	TRANSMIT SPOOL to NO SPOOL OUTPUT	This transition occurs whenever the equipment has sent the maximum number of messages (as set by the MaxSpoolTransmit Equipment Constant) to the Host and the spool is not empty. The SpoolUnloadSubState is set to 5 (no spool output).
7	TRANSMIT SPOOL to NO SPOOL OUTPUT	This transition occurs whenever a communication failure is detected while spooled messages are being sent to the host. Typically, a communication failure is indicated when the RTY count exceeds its limit. The message that could not be sent remains in the spool. The GemSpoolTransmitFailure event occurs.
8	POWER ON to POWER OFF	This transition occurs whenever the equipment is shut down. The current spool state is always saved in non-volatile storage so that the system can restart in the same state it was in when it was shutdown.
9	POWER OFF to POWER ON	This transition occurs whenever the equipment is started. Whatever spooling state was active at the time of the last shutdown is entered on this transition.

Process Program Events

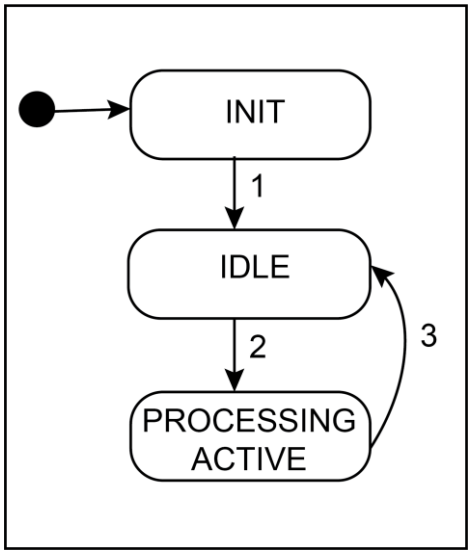
The following table shows Process Program Events.

#	Name and description	Suggested data
1	`GemBadDownloadEvent` If the process program received from host is invalid.	-
5	`GemPPChangeEvent` When the operator creates, changes, or deletes a process program.	40: `PPChangeName` 41: `PPChangeStatus`

Processing State Model

The GEM model for the equipment-processing states below shows the top-level equipment states and the normal transitions for the Keithley Automated Parametric Tester (APT) System.

Figure 9: Processing State diagram



Processing State definitions

The following are the possible processing states and their definitions.

- INIT – The equipment is performing the power-up initialization routines.
- IDLE – The equipment has completed the power-up initialization routines but is not running any tests and is awaiting instructions.
- PROCESSING ACTIVE – The equipment is running a test. The PROCESSING ACTIVE state has several OR substates:
  - LOADING WAFER – The equipment is loading a wafer for testing.
  - MOVING TO SITE – The equipment is moving to the next test site.
  - MOVING TO SUBSITE – The equipment is moving to the next test subsite.
  - TESTING – The equipment is running tests.
  - UNLOADING WAFER – The equipment is unloading a wafer into the cassette.
  - WAITING FOR USER INPUT – The equipment is waiting for operator input.
  - TERMINATING TEST PROGRAM – The equipment is terminating the current test.
  - OPERATOR ABORT – The operator has aborted the current test.

Transition to any of these PROCESSING ACTIVE substates is controlled by the user. This is achieved by calling the KtpNewEquipState() library function at user-access points (UAPs). The system is shipped with a set of default UAP routines that can be used as a starting point in configuring the PROCESSING ACTIVE substate transitions. This approach allows users to customize the level of host visibility of the PROCESSING ACTIVE substates.

Processing State Transitions

The following are the transitions for the processing states listed in the previous section.

#	State transition	Description
1	INIT to IDLE	This transition occurs when the equipment completes all its power-up initialization routines.
2	IDLE to PROCESSING ACTIVE	This transition occurs when KtpNewEquipState() to one of the PROCESSING ACTIVE substates is called by a user-access routine.
3	PROCESSING ACTIVE to IDLE	This transition occurs when KtpNewEquipState(EQUIPIdle) is called by a user-access routine. This transition occurs at the end of all tests.

The equipment tracks the current and previous process states in the ProcessState (VID=37) and PreviousProcessState (VID=36) Status Variables. The current Process State is displayed in KIDS in the Process Status field. Whenever the Process State changes, the RunStateChanged (CEID=101) event is signaled. The Host can configure a report and link it to this event.

Processing State Events

The following table shows the Processing State Events for the Processing State Model.

#	Event name description / trigger	Suggested data
101	`RunStateChanged` When the process state is changed.	-

Keithley Process Events

The CEIDs marked with an asterisk (*) can be customized. Contact Keithley for assistance and further details.

#	Event name description / trigger	Suggested data
102*	`StartWafer` When tests on a wafer are started.	107: `WaferID` 109: `SlotID` 110: `SplitID` 132: `WaferPlanID` 153: `WaferDescriptionID` 154: `LimitFileID`
103*	`EndOfSite` When tests on a wafer are started.	108: `SiteID`
104*	`EndOfWafer` When a wafer has completed testing.	107: `WaferID`
105*	`EndOfLot` When a lot has completed testing.	100: `LotID`
106*	`CustomDataAvailable` When custom data results become available.	114: `CustomDataType` 115: `BlockOfBinaryData`
119-130*	`KeiGPEvent1` to `KeiGPEvent12` General-purpose (user defined) event #1 to General-purpose (user defined) event #12.	-
131	`CassetteAtProber` Cassette is received at prober.	-
132	`Port1Clamped` Port #1 is clamped.	-
133	`Port2Clamped` Port #2 is clamped.	-
134	`Port1Unclamped` Port #1 is unclamped.	-

#	Event name description / trigger	Suggested data
135	`Port2Unclamped` Port #2 is unclamped.	-
136	`Cassette1IdRead` Cassette #1 ID is read.	133: `Cassette1ID`
137	`Cassette2IdRead` Cassette #2 ID is read.	134: `Cassette2ID`
138	`Cassette1Received` Cassette #1 is received.	-
139	`Cassette2Received` Cassette #2 is received.	-
140	`Cassette1Sent` Cassette #1 is removed.	-
141	`Cassette2Sent` Cassette #2 is removed.	-
142	`Cassette1Request` Cassette #1 is requested.	-
143	`Cassette2Request` Cassette #2 is requested.	-
144	`Cassette1SendRequest` Removal of cassette #1 is requested.	-
145	`Cassette2SendRequest` Removal of cassette #2 is requested.	-
146*	`StartOfLot` When a lot has started testing.	100: `LotID` 104: `TestStartTime` 101: `TestProgramName` 148: `TestProgramArgs`
147*	`LotAborted` When a lot is aborted.	100: `LotID` 111: `ProberErrorCode` 112: `KeithleyErrorCode` 113: `KeithleyErrorText`
148*	`LotStopped` When a lot is stopped.	100: `LotID` 112: `KeithleyErrorCode` 113: `KeithleyErrorText`
149*	`EndOfTest` When a test is completed.	152: `TestMacroID` 105: `TestEndTime`
150	`S10Ack` When operator acknowledges a message sent by host.	-

#	Event name description / trigger	Suggested data
151	PPSelected When a recipe is selected.	101: TestProgramName
152	OperatorCommand When operator issues a command while the equipment is under remote control.	-
153	OperatorECChange Operator changes an Equipment Constant value.	72: ECIDChange
154	Port1Loaded Port #1 is loaded.	-
155	Port2Loaded Port #2 is loaded.	-
156	Port1Unloaded Port #1 is unloaded.	-
157	Port2Unloaded Port #2 is unloaded.	-
158*	TestDataAvailable	136: TestResultCount 137: ArrayResultCount 1001 - 1450: TestResult1 – TestResult450 2001 - 2450: TestResult1Tag – TestResult450Tag 116 - 120: TestResultArray1 – TestResultArray5 121 - 125: TestResultArray1Tag – TestResultArray5Tag
159*	LotPaused When a lot is paused.	100: LotID
160*	LotResumed When a lot is resumed.	100: LotID
161*	EndOfSubsite When a subsite has completed testing.	149: SubsiteID 150: SubsiteX 151: SubsiteY
162*	LotInfoAvailable When lot information is available for upload.	103: TesterID 100: LotID 102: Product(Device)Type 106: ProcessType 135: OperatorID 155: ProductFileID

#	Event name description / trigger	Suggested data
163	`ToolStateChanged` When the Tool State is changed.	-
164	`Cassette1Mapped` Cassette #1 is mapped.	141: `Cassette1SlotMap`
165	`Cassette2Mapped` Cassette #2 is mapped.	142: `Cassette2SlotMap`
166	`Port1StateChanged` When Port #1 state is changed.	-
167	`Port2StateChanged` When Port #2 state is changed.	-
168	`Lot1StateChanged` When Lot #1 state is changed.	-
169	`Lot2StateChanged` When Lot #2 state is changed.	-
170	`Prober1Error` When there is an error in completing a prober command for Port #1.	113: `KeithleyErrorText`
171	`Prober2Error` When there is an error in completing a prober command for Port #2.	113: `KeithleyErrorText`
172	`Prober1AlarmCleared` Cassette #1 unloaded prober alarm is cleared (applicable on TSK UF200 probers only).	-

#	Event name description / trigger	Suggested data
173	`Prober2AlarmCleared` Cassette #2 unloaded prober alarm is cleared (applicable on TSK UF200 probers only).	-
174	`StartButtonEnabled` GemCP Start button is enabled.	-
175	`StartButtonDisabled` GemCP Start button is disabled.	-
176	`Prober1ErrorContinued` Port #1 prober error window's Continue button is pressed by the operator.	111: `ProberErrorCode` 112: `KeithleyErrorCode` 113: `KeithleyErrorText`
177	`Prober2ErrorContinued` Port #2 prober error window's Continue button is pressed by the operator.	
178	`Prober1ErrorSkipped` Port #1 prober error window's Skip button is pressed by the operator.	
179	`Prober2ErrorSkipped` Port #2 prober error window's Skip button is pressed by the operator.	
180	`Prober1AlreadyDone` The last prober command for port #1 is not applicable. Prober is already in the desired state.	113: `KeithleyErrorText`
181	`Prober2AlreadyDone` The last prober command for port #2 is not applicable. Prober is already in the desired state.	113: `KeithleyErrorText`
182*	`StartOfTest` A test macro is started.	152: `TestMacroID`
183*	`StartOfSite` A new test site is started.	108: `SiteID` 126: `SiteRow` 127: `SiteCol`

#	Event name description / trigger	Suggested data
184*	`StartOfSubsite` A new subsite is started.	149: `SubsiteID` 150: `SubsiteX` 151: `SubsiteY`
185	`StartError` When there is an error in starting a test.	113: `KeithleyErrorText`
186	`ProbeCardDataAvailable` When probe card data is available for upload.	
187	`ProbeCardError` When there is an error related to probe card.	112: `KeithleyErrorCode` 113: `KeithleyErrorText`
188	`ProberFileIDAvailable` When prober file ID is available for upload.	163: `ProberFileID`
189	`ProbeCardRemoved` When probe card removed, event is reported by prober.	211: `PrevProbeCardModel` 212: `PrevProbeCardType` 213: `PrevProbeCardSerial` 214: `PrevProbeCardComment` 215: `PrevProbeCardCycle` 216: `PrevProbeCardLife`
190	`ProbeCardAttached` When probe card attached, event is reported by prober.	-
191	`ProbeCardChangeStarted` When probe card changed, process is started by operator.	-
192	`ProbeCardCountUpdated` When probe card count is updated.	-
193	`AbortedByOperator` When test is aborted by operator.	113: `KeithleyErrorText`
194	`StoppedByOperator` When test is stopped by operator.	113: `KeithleyErrorText`
195	`PausedByOperator` When test is paused by operator.	-
196	`ResumedByOperator` When test is resumed by operator.	-
197	`StartedByOperator` When test is started by operator.	-

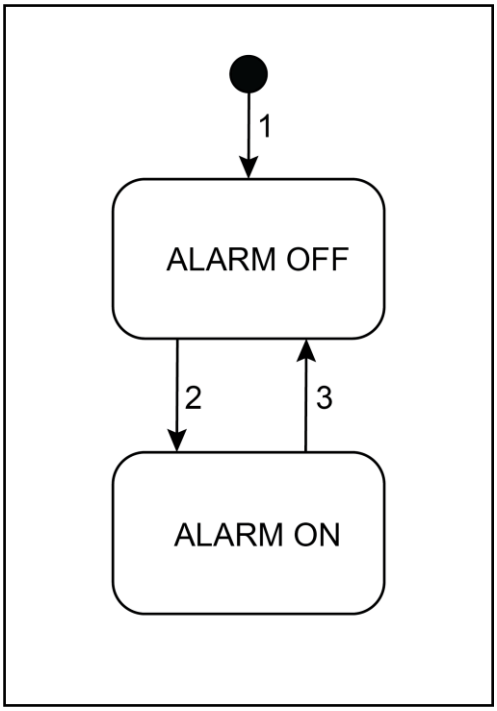
#	Event name description / trigger	Suggested data
198	`WaitingForOperator` When tester is waiting for an operator action.	-
199*	`StartOfCarrier` When a carrier has started testing.	-
200*	`EndOfCarrier` When a carrier has completed testing.	-
201*	`StartOfFirstWafer` When tests on the first wafer of the carrier is started.	-
3000	`MiniDiagOK` Mini-Diagnostic check was completed successfully.	-
3001	`MiniDiagFailed` Mini-Diagnostic check found an error condition.	113: `KeithleyErrorText`
3002	`ProbeCardCheckOK` Probe card check was completed successfully.	
3003	`ProbeCardCheckError` Probe card check found an error condition.	113: `KeithleyErrorText`
3004	`RecipeDownloadOK` Recipe download was completed successfully.	-
3005	`RecipeDownloadError` Recipe download found an error condition.	113: `KeithleyErrorText`
3006	`RecipeIDOK` Recipe ID check was completed successfully.	-
3007	`RecipeIDError` Recipe ID check found an error condition.	113: `KeithleyErrorText`
3008	`ProberRecipeCheckOK` Prober recipe check was completed successfully.	163: `ProberFileID`
3009	`ProberRecipeCheckError` Prober recipe check found an error condition.	113: `KeithleyErrorText`
3010	`StartOfPMI` Prober starts the Probe Mark Inspection (PMI).	-
3011	`EndOfPMI` Prober ends the Probe Mark Inspection (PMI).	-
3012	`WaferIDReadOK` Wafer ID was read successfully.	107: `WaferID`

#	Event name description / trigger	Suggested data
3013	`WaferIDReadError` An error condition was found when reading wafer ID.	113: `KeithleyErrorText`
3014	`MiniDiagStarted` Mini-Diagnostic check is started.	-
3015	`WaferIDMismatchError` Wafer ID read does not match expected wafer ID.	113: `KeithleyErrorText`
3016	`ChuckTempReadOK` Chuck, stage, and temperature were read successfully.	166: `ChuckCurrentTemp` 167: `ChuckSettingTemp`
3017	`ChuckTempReadError` An error condition was found when reading chuck/stage temperature.	113: `KeithleyErrorText`
3018*	`WaferTestResultsOK` Wafer test results are within user-defined criteria.	107: `WaferID`
3019*	`WaferTestResultsError` Some of the wafer test results do not meet user-defined criteria.	107: `WaferID` 113: `KeithleyErrorText`
5500	`PrbHsmsCommDisabled` When `PrbHsmsCommStatus` (`VID=5500`) changes to Disabled.	-
5501	`PrbHsmsCommEnabled` When `PrbHsmsCommStatus` (`VID=5500`) changes to Enabled.	-
5502	`PrbOnlineLocal` When `PrbControlState` (`VID=5504`) changes to Online – Local.	-
5503	`PrbOnlineRemote` When `PrbControlState` (`VID=5504`) changes to Online – Remote.	-
5504	`PrbCarrIdVerCancelByOpr` When Carrier ID Verification is canceled by operator.	-
5505	`PrbSlotMapVerCancelByOpr` When Slot Map Verification is cancelled by operator.	-
5507	`ProjectNameChanged` When "project" name is successfully changed.	-
5508	`RfiFileChanged` When RFI file (`.rfi`) is successfully changed.	-

Alarm State Model

The following diagram shows the Alarm State Model. The following sections show the definitions and Transitions for this model.

Figure 10: Alarm State Model



Alarm State definitions

Each alarm in the equipment has its own state machine. Any number of alarms may be in the same state simultaneously.

The possible alarm states are:

- `ALARM OFF`
  - The `ALARM OFF` state indicates that the hazardous condition alarm does not exist. The equipment is safe regarding the alarm. A hazardous condition is defined to be a condition which could lead to damage or injury to the operator, equipment, or material.
- `ALARM ON`
  - The `ALARM ON` state indicates that a hazardous condition exists within the equipment. A hazardous condition is defined to be a condition which could lead to damage or injury to the operator, equipment, or material.

Alarm State Transition Events

The following are the transitions for the alarm states listed in the previous section.

#	State transition	Description
1	Initial Entry	All alarms in the system are initialized to the `ALARM OFF` (safe condition).
2	`ALARM OFF` to `ALARM ON`	The transition from `ALARM OFF` to `ALARM ON` occurs whenever the equipment detects an unsafe condition. If reporting for the alarm has been enabled by the Host, then an alarm report is sent to the Host with an S5F1 message. The `AlarmId` Discrete Variable is set to the `ALID` of the alarm and the `AlarmState` Status Variable is set to `1`, indicating the transition was from OFF to ON.
3	`ALARM ON` to `ALARM OFF`	The transition from `ALARM ON` to `ALARM OFF` occurs whenever the equipment detects that an unsafe condition no longer exists. If reporting for the alarm has been enabled by the Host, then an alarm report is sent to the Host with an S5F1 message. The `AlarmID` Discrete Variable is set to the `ALID` of the alarm and the `AlarmState` Status Variable is set to `0`, indicating the transition was from ON to OFF.

Alarm ON/OFF Events

The following table shows Alarm ON/OFF Events.

#	Name and description	Suggested data
107	`KeiEvent1` Configuration Error (`TPConfigError`) Alarm has transitioned to ON.	112: `KeithleyErrorCode` 113: `KeithleyErrorText`
108	`KeiEvent2` `TPConfigError` Alarm is OFF.	-
109	`KeiEvent3` Hardware Error (`TPHWError`) Alarm has transitioned to ON.	112: `KeithleyErrorCode` 113: `KeithleyErrorText`
110	`KeiEvent4` `TPHWError` Alarm is OFF.	-
111	`KeiEvent5` Software Error (`TPSWError`) Alarm has transitioned to ON.	112: `KeithleyErrorCode` 113: `KeithleyErrorText`
112	`KeiEvent6` `TPSWError` Alarm is OFF.	-
113	`KeiEvent7` Data Overflow (`DataOverflow`) Alarm has transitioned to ON.	112: `KeithleyErrorCode` 113: `KeithleyErrorText`

#	Name and description	Suggested data
114	KeiEvent8 DataOverflow Alarm is OFF.	-
115	KeiEvent9 Prober Error (ProberAlarm) Alarm has transitioned to ON.	111: ProberErrorCode 112: KeithleyErrorCode 113: KeithleyErrorText
116	KeiEvent10 ProberAlarm Alarm is OFF.	-

Events for relaying prober Alarms

The following table shows prober Alarm Events.

CEID	Name and description	Suggested data
5550	PrbAlarmEventOff Any prober Alarm OFF.	5505: PrbAlarmID 5506: PrbAlarmText
5551	PrbAlarmEventOn Any prober Alarm ON.	5505: PrbAlarmID 5506: PrbAlarmText

Section 4

Variables

In this section:

Introduction

This section describes the variables that are implemented in this equipment to support the SEMI E87 Carrier Management, SEMI E90 Substrate Tracking, SEMI E94 Control Job Management, SEMI E40 Process Management, and SEMI E30 GEM Standards.

The following are the column heading definitions used in this section.

- **VID**: The variable identifier. This is a unique number assigned for identifying the variable.
- **Class**: The type of variable. Types include Equipment Constant (EC), Status Variable (SV), and Data Variable (DV).
- **Format**: SML Item Format Mnemonic. Types include list (L), binary (B), boolean (BOOLEAN), ASCII (A), 1-byte unsigned integer (U1), 2-byte unsigned integer (U2), and 4-byte unsigned integer (U4).
- **Name and description**: The full variable name, an explanation of the purpose of the variable, and an example of the code format used for the variable, if applicable.

Global GEM variables

The following variables are used globally.

VID	Class	Format	Name and description
5303	EC	U1 [Default: 3]	PRMtrlOrder. Defines the order in which the material in the PJ Material List is completed. Values are: 1 = ARRIVAL - Process whichever material arrives first. 2 = OPTIMIZE - Process in an order that maximizes throughput. 3 = LIST - Follow the order in the list.
8009	EC	Boolean [Default: FALSE]	AssocEventBeforeCarrierInit. Used to report the AssocSMGoAssoc or AssocSMReassoc Events before Carrier initialized Event (CarrierSMTrans01). TRUE = ConX300™ will report the AssocSMGoAssoc or AssocSMReassoc Events before the CarrierSMTrans01 Event. FALSE = The CarrierSMTrans01 Event will be reported before the AssocSMGoAssoc or AssocSMReassoc Events.
8011	EC	Boolean [Default: FALSE]	OptionalS3F28Fmt. This optional EC provides an alternate response format for the S3F27 Change Access message. When configured, if a S3F27 message is sent for all ports, the S3F28 reply format is changed to provide an error code (if that is the case) only for the ports that are registered to Mission Assistant. TRUE = If a S3F27 message is sent for all ports, the S3F28 reply format is changed to provide an error code only for the ports that are registered to the Mission Assistant. FALSE = Retains the original message format.
8016	EC	Boolean [Default: FALSE]	OptionalS14F12Fmt. This optional EC provides an alternate response format for the S14F12 Delete Object Acknowledge message. TRUE = ConX300 returns all attributes specified by the host in the primary message whenever an exception occurs. FALSE = Retains the original message format. Attributes are only returned if the E39 object specified in the request was found and deleted (meaning no error occurred).

VID	Class	Format	Name and description
8017	EC	Boolean [Default: FALSE]	OptionalS14F2Fmt2. Provides an alternate response format for the S14F2 GetAttr Data message. When configured, the S14F2 reply format is changed to provide an error code for the case where the requested OBJID is not found; each object specified in an S14F1 message with No Filter will be listed in the reply S14F2 message. Any ATTRDATA items that cannot be reported correctly will be reported as zero-length items.
8101	EC	U4 [Default is 30]	GemConfigIPCTimeout. An optional equipment constant that allows the user to choose how ConX300 will work with the IPC timeout in terms of seconds. If it doesn't appear in the GCD file, then the ConX300 daemon will run as if it was set to 30 seconds, which is the manner ConX300 has historically operated. It is only necessary to include this equipment constant definition if the desire is for ConX300 to operate with another value for IPC timeout instead of 30 seconds. If ConX300 is to operate with another value for IPC timeout, then a variable named GemConfigIPCTimeout must be defined as an equipment constant in the GCD file. The data item type must be one of U1, U2, U4, I1, I2 and I4.
8111	EC	U4 [Default is 0]	CfgDisableLogging. When this EC is not present or set to 0, ConX300 logging is not affected. However, when the following bits of the value are set, logging is restricted in those areas: #define EPT_LOG_FLAG 0x00000001 /* bit 00 */ #define HOSTMSG_LOG_FLAG 0x00000002 /* bit 01 */ #define GETATTR_LOG_FLAG 0x00000004 /* bit 02 */ When the EC value is set to 1, Equipment Performance Tracking (EPT) log output is restricted. If the EC value is set to 2, Host message logging is restricted. By combing these values and setting the first and second bits, 1 + 2 = 3, both EPT and HostMsg logging outputs are restricted. Finally, logging of GemGetAttr calls is restricted by setting bit02 (or adding 4) to the current EC value. For example, setting all bits, 1 + 2 + 4 = 7, restricts logging in all 3 areas.
8113	EC	U4 [Default is 2]	CfgE39ObjSave. ConX300 automatically stores the current state of the Port, Carrier, Substrate, Substrate Location, and EPT objects (as well as Pod, Reticle, and Reticle Location objects, if the equipment supports E109) after any state change is made to these objects. As each object is modified, its state is stored to disk. Upon restart of ConX300, the saved state is restored. This feature can be enabled or disabled by setting the appropriate bit in a controlling equipment constant CfgE39ObjSave.

VID	Class	Format	Name and description
8200	SV	L	Global. The entire Global Object. There is only one. The format is: <L <L [2] <A "ObjType"> <A "Global"> > <L [2] <A "ObjID"> <A "ConX"> > <L [2] <A AttributeName[1]> <AttributeValue[1]> > <L [2] <A AttributeName[2]> <AttributeValue[2]> > ... <L [2] <A AttributeName[n]> <AttributeValue[n]> > >
8201	SV	A [1..80]	GlobalID. Contains the name of the Global Object. This is defined as ConX internally

Carrier Management Variables

The following variables are used for Carrier Management.

VID	Class	Format	Name and description
5101	EC	Boolean [Default: FALSE]	BypassReadID This Equipment Constant can be used to modify the operation of E87 Carrier ID Verification logic for all Load Ports with an unavailable Carrier ID Reader. See the E87 standard for details. Values are: TRUE = BYPASSREADID IS ACTIVATED FALSE = BYPASSREADID IS DEACTIVATED
5102	EC	U1 [Default: 0x00]	ISMTFlowChartsV09 This Equipment Constant can be used to modify the operation of the equipment's E87 logic to match certain host computers in the case where (1) a carrier arrives at a Load Port that has no pending Bind, and either (2A) no Carrier ID reader is present or (2B) a Carrier ID Read Failure occurs. In this condition, the equipment has not yet created a Carrier Object corresponding to the physical carrier which has arrived. Values are: 0x00 = The equipment uses standard E87 logic, as follows: In case (2A) or (2B) above, the equipment signals event CarrierIDReadFail. 0x01 = The equipment uses logic as defined in International Sematech Operational Flowcharts Version 09, as follows: In case (2A) above, the equipment signals event CarrierSMTrans03 (Transition to WaitingForHost). In case (2B) above, the equipment signals event CarrierSMTrans03 (Transition to WaitingForHost) and then sends event CarrierIDReadFail. This Equipment Constant should be set before the equipment is powered on. If you change the value, you should re-initialize the equipment. Changing the value during wafer processing may yield unpredictable results.

VID	Class	Format	Name and description
5103	EC	U1 [Default: 0]	CfgWIDAngle This Equipment Constant allows activating the Wafer ID Angle special feature, which is required by certain host computers, although it modifies certain logic in SEMI standards E87 and E90. Values are: 0x00 = The feature is deactivated. The equipment uses standard E87 and E90 logic. 0x01 = The feature is activated. The Carrier Object has the additional Attribute WID_Angle. The Substrate Object has the additional Attribute SubstWID_Angle. This Equipment Constant should be set before the equipment is powered on. If you change the value, you should re-initialize the equipment. Changing the value during wafer processing may yield unpredictable results.
5104	EC	U1 [Default: 0]	ClampControl This Equipment Constant controls how quickly the equipment will unclamp a carrier prior to Unload. Values are: 0 = CARRIER_COMPLETE. When a carrier is completed (or cancelled) at a Load Port, the equipment will immediately undock and unclamp the carrier and the Load Port Transfer State will change to Ready To Unload. This is the default action for Load Ports whose access mode is MANUAL. 1 = AMHS_TRIGGERED. When a carrier is completed (or cancelled) at a Load Port and the Load Port Access Mode is AUTO, the equipment will undock the carrier, but will not unclamp it, and the Load Port Transfer State will remain in Transfer Blocked. When the AMHS arrives and begins E84 PIO transfer sequences, the equipment will unclamp the carrier and the Load Port Transfer State will transit to Ready To Unload.
5105	EC	U1 [Default: 0]	CarrierHoldControl This Equipment Constant specifies whether the Equipment should release carriers from Tag Write positions immediately when a carrier is completed (or stopped) or wait for a host S3F17 CarrierRelease (on page 7-14) command to allow the host to perform Tag Read/Write operations before the equipment moves the carrier. Values are: 0 = EQUIP_RELEASE. The equipment may move completed (or stopped) carriers immediately. 1 = HOST_RELEASE. Equipment must wait for the host to send S3F17 CarrierRelease (on page 7-14) before moving a completed (or stopped) carrier away from the Tag Read/Write location.

VID	Class	Format	Name and description
5106	EC	U1 [Default: 1]	LoadPortClampType This Equipment Constant specifies when a carrier can be clamped to the Load Port. Values are: 0 = CLAMP_ON_DOCK. The carrier is physically able to be clamped when it is positioned at the FIMS location of the Load Port. When the carrier is moving or positioned at the Load/Unload location of the Load Port, the carrier cannot be clamped. 1 = CLAMP_ALWAYS. The carrier is physically able to be clamped, regardless of its location within the Load Port.
5107	EC	U1 [Default: 0]	CfgSlotMapVerify Allows the selection of non-standard Slot Map Verification scenarios for certain non-standard host computers. Values are: 0 = SEMI Standard Format. Material is considered "arrived" after the Slot Map Verification OK. 1 = Non-SEMI Standard Format. Material is considered "arrived" after Carrier ID Verification OK.
5108	EC	U1 [Default: 1]	TagReleaseOnCancelOrFail When this Equipment Constant is set to TRUE (1), ConX300 will automatically release the carrier when the carrier is canceled, regardless of the setting of the Equipment Constant CarrierHoldControl.
5109	SV	L	CarrierLocationMatrix Shows all Carrier Locations in the equipment and the Carrier ID currently at that Location, if any. Format is: <L [NumberOfLocations] <L[2] <A[1..80] LocationID> <A[0..80] CarrierID> > ... > An ordered list, corresponding to Load Port 1, 2. If there is no carrier at a given Location, the CarrierID at that Location will be zero-length. When a carrier is moving between two Locations, it is shown at the starting Location until the move is finished and thereafter at the ending Location. This Variable shows all carriers currently in the equipment whose CarrierID is known. It does not show carriers which have been predicted by Bind or CarrierNotification, but which have not yet arrived, nor carriers whose CarrierID is unknown.

VID	Class	Format	Name and description

5140	SV	L	`PortList`
			
			The numerical list of all Load Ports on the equipment.
			
			Format is:
			
			`<L[NumberOfPorts]`
			`  <U1 PTN >`
			`  ...`
			`>`
			
			An ordered list, corresponding to Load Port 1, 2, …

5141	SV	L	`PortAssociationStateList`
			
			Shows the E87 Load Port Carrier Association State for all Load Ports on the equipment.
			
			Format is:
			
			`<L [NumberOfPorts]`
			`  <U1 PortAssociationState>`
			`  ...`
			`>`
			
			An ordered list, corresponding to Load Port 1, 2, …
			For code details, see `PortAssociationState` in Current Load Port Variables (on page 4-20).

5142	SV	L	`PortStateInfoList`
			
			Shows information about all Load Ports on the equipment.
			
			Format is:
			
			`<L [NumberOfPorts]`
			`  <L[2]`
			`  <U1 PortAssociationState1>`
			`  <U1 PortTransferState1>`
			`  >`
			`  ...`
			`>`
			
			An ordered list, corresponding to Load Port 1, 2, …
			For code details, see `PortAssociationState` and `PortTransferState` in Current Load Port Variables (on page 4-20).

VID	Class	Format	Name and description

5143	SV	L	`PortTransferStateList`
			
			Shows the E87 Load Port Transfer State for all Load Ports on the equipment.
			
			Format is:
			
			`<L [NumberOfPorts]`
			`  <U1 PortTransferState>`
			`  ...`
			`>`
			
			An ordered list, corresponding to Load Port 1, 2, …
			For code details, see `PortTransferState` in Current Load Port Variables (on page 4-20).

5144	SV	L	`PortReservationStateList`
			
			This variable represents the list of Reservation States for all registered ports.
			
			Format is:
			
			`<L [NumberOfPorts]`
			`  <U1 PortReservationState>`
			`  ...`
			`>`
			
			An ordered list, corresponding to Load Port 1, 2, …
			For code details, see `PortReservationState` in Current Load Port Variables (on page 4-20).

VID	Class	Format	Name and description
5149	DV	U1	Reason When Carrier State Transition #7 occurs, this variable shows the reason for the transition. Values are: 2 = CARRIER ID READ FAIL 4 = WRONG PORT When Carrier State Transition #9 or Carrier State Transition #16 occurs, it shows the reason for the transition. Values are: 5 = CANCEL CARRIER COMMAND RECEIVED FROM HOST 6 = EQUIPMENT-INITIATED CANCEL CARRIER DUE TO DUPLICATE CARRIER ID When Carrier State Transition #14 occurs, it shows the reason for the transition. Values are: 0 = SLOT MAP VERIFICATION NEEDED 1 = SLOT MAP VERIFICATION BY EQUIPMENT UNSUCCESSFUL 2 = SLOT MAP READ FAILURE 3 = SLOT MAP IMPROPER SUBSTRATE POSITION
5150	EC	U4 [Default: 0]	LoadportAccessModeAlreadyManual When set to a value other than 0, an error results when attempting to change the Load Port Access Mode to MANUAL when it is already in MANUAL mode. Values are: 0 = No Error (default) Any other value = Rejection. The return code is used in the reply message to the host.
5151	EC	U4 [Default: 0]	LoadportAccessModeAlreadyAutomatic When configured to a value other than 0, an error results when attempting to change the Load Port Access Mode to AUTOMATIC when it is already in AUTOMATIC mode. Values are: 0 = No Error (default) Any other value = Rejection. The return code is used in the reply message to the host.

VID	Class	Format	Name and description
5152	EC	U4 [Default: 0]	LoadportAlreadyInService When configured to a value other than 0, an error results when attempting to change the Load Port Service State to IN SERVICE when it is already IN SERVICE. Values are: 0 = No Error (default) Any other value = Rejection. The return code is used in the reply message to the host.
5153	EC	U4 [Default: 0]	LoadportAlreadyOutOfService When configured to a value other than 0, an error results when attempting to change the Load Port Service State to OUT OF SERVICE when it is already OUT OF SERVICE. Values are: 0 = No Error (default) Any other value = Rejection. The return code is used in the reply message to the host.
5160	EC	U1 [Default: 0]	UnclampLogic Controls which scenario or interpretation of E87 AMHS-Triggered-Unclamp this equipment uses. Values are: 0 = Scenario A (SEMATECH) 1 = Scenario B (SELETE)
5161	EC	BOOLEAN [Default: FALSE]	PreventCAACK4Later Created for legacy host systems. If present with a value of "TRUE," only CAACK = 0 will be sent to the host (for legacy systems). If the Equipment Constant is missing, CAACK = 4 will be sent for the indicated services.
5162	EC	U1 [Default: 25]	DefaultCarrierCapacity Defines default length of the carrier slotmap list, before the actual carrier capacity is defined or determined. Set value to a fab-specific size of carrier, ranging from 1 to 25. If the VID is missing or its value exceeds the range, a default value of 25 will be used.
5163	EC	U1 [Default: 1]	ECSReadyToLoad When the value is FALSE, port will transition to WaitingForTray state after port is done unloading, buffering, or has stopped unbuffering. 0 = FALSE Value other than 0 = TRUE

VID	Class	Format	Name and description
5190	SV	L	CarrierOutQueue Queue of CarrierID/PortID pairs. Each received CarrierOutQueue adds one entry to the back of the queue. Format is: <L NumberOfPairs <L[2] <A[1..80] CarrierID> <U1 PortID> > >
8000	EC	Boolean [Default: FALSE]	OrigEFEMLoadPortBias OrigEFEMLoadPortBias is an equipment constant that is used to maintain the original EFEM Load Port bias for older applications. When set to TRUE, EFEM Load Ports will have a limited effect on the Equipment EPT Module. In only two cases will they cause the EPT Equipment Module to transition and report a Collection Event: ■ When an EFEM Load Port Module transitions to BLOCKED, and now all EFEM Load Ports on the Equipment are blocked. This will cause the Equipment EPT Module to transition to blocked, even if it already is blocked. ■ When an EFEM Load Port Module transitions to IDLE or BUSY, and previously all EFEM Load Ports were BLOCKED. This will cause the Equipment EPT to transition also. When set to FALSE, the EFEM Load Port acts just like any other Production EPT Module regarding affecting the Equipment EPT Module.
8002	EC	Boolean [Default: FALSE]	ExtraCarrierLocEvents ExtraCarrierLocEvents is an equipment constant that is used to report extra Carrier Location Events when the Carrier is loaded/unloaded to/from a Carrier Location. TRUE = Carrier Location Change Collection Events will also be reported when the Carrier is loaded and unloaded. FALSE = Carrier Location Change Collection Events will only be reported when a Carrier already exists and is moved between Carrier Locations.
8003	EC	Boolean	CancelCarrierRejectOption Allows the ECS to reject a HostCancelCarrier Service Message (S3F17) via the NoteCancelCarrier call. TRUE = the return code from the NoteCancelCarrier is examined by ConX300 for a non-zero return code (reject). If rejected, the HostCancelcarrier will not occur and an error code will be return within S3F18. FALSE = the return code of NoteCancelCarrier is ignored.

VID	Class	Format	Name and description
8004	EC	Boolean [Default: FALSE]	ExposeRecreateCarrier Specifies whether the newly Recreated Carrier object or the previously present Carrier object is available during a NoteCarrierRecreate callback. The NoteCarrierRecreate callback is issued when a Carrier Recreate Message (S3F17) is received from the Host. TRUE = The Recreated Carrier object is available to the ECS during the NoteCarrierRecreate callback. FALSE = The previous Carrier object is available to ECS during the NoteCarrierRecreate callback.
8005	EC	Boolean	AllowNonStandardCarrierCapacity Permits the non-standard Carrier capacity from 26 to 30. SEMI restricts this value to 25. When the value is TRUE, non-standard Carrier capacity up to 30 is allowed. When the value is FALSE or not provided, the SEMI standard limit of 25 is enforced. Values are: 0 = FALSE Value other than 0 = TRUE.
8108	EC	U1 [Default is 0]	PortAttributePrefixOption Determines the naming procedure used for LoadPort objects. Possible values are: 0 = Follows the ConX300 5.11 naming procedure (AccessMode, ReservationState, AssociationState) 1 = Follows the SEMI Standard naming procedure (AccessMode, LoadPortReservationState, PortAssociationState) 2 = Default value. Follows the ConX300 4.3 naming procedure (PortAccessMode, PortReservationState, PortAssociationState)
8203	SV	L	PortAccessModeList Provides a list of the AccessMode (MANUAL = 0, AUTOMATIC = 1) for all defined Ports List of n items, where n = number of load ports on the system. Each item is a U1 enumerated value indicating the AccessMode of each port. Values are: 0 = MANUAL 1 = AUTO <L [Number of Ports] <U1 1> /* Port 1 access mode */ <U1 0> /* Port 2 access mode */ ... <U1 1> /* Port n access mode */ > .

VID	Class	Format	Name and description

8204	SV	L	`PortCarrierIDList`
			
			Provides a list of Carrier IDs for all defined `portsList` of `n` items where `n` = number of load ports on the system. Each item is an A[`0..80`] String identifier of the `CarrierID` at the specific port. For example:
			
			`<L [Number of Ports]`
			`  <A "CS001"> /*Carrier ID at Port 1*/`
			`  <A "CS002"> /*Carrier ID at Port 2*/`
			`  ...`
			`  <A "CS00N"> /*Carrier ID at Port N*/`
			`> .`

Current Carrier Data Variables

When a Carrier-related event occurs, the following Data Variables hold the attributes for the Carrier Object.

VID	Class	Format	Name and description
5110	DV	L	Carrier When a carrier-related event occurs, this Variable contains the entire related (current) Carrier Object. Format is: <L [NumberOfAttributes] <L [2] <A "ObjType"> <A "Carrier"> > <L [2] <A "ObjID"> <A CarrierID> > <L [2] <A AttributeName> <AttributeValue> > ... >
5111	DV	U1	CarrierAccessingStatus Status showing whether the equipment has accessed the Substrates in this carrier. Values are: 0 = NOT ACCESSED 1 = IN ACCESS 2 = CARRIER COMPLETE (Process finished normally) 3 = CARRIER STOPPED (Process finished abnormally)
5112	DV	U1	CarrierCapacity The number of slots in the carrier. If unknown, the value may be zero-length. This value is assured correct only after CarrierSlotMapStatus is SlotMapVerificationOK.

VID	Class	Format	Name and description
5113	DV	L	CarrierContentMap Identifies the Substrate contained in each Slot of the carrier. An ordered series of two-element lists, corresponding to carrier Slots 1, 2, ... n. Format is: <L [NumberOfSlots] <L [2] <A[0..80] LotID> <A[0..80] SubstrateID > > ... > This attribute only applies to Slots whose SlotMap SlotStatus is CORRECTLY OCCUPIED. If the Lot ID is unknown, it will be zero-length. If the Substrate ID is unknown, it will be zero-length. If both Lot ID and Substrate ID are unknown, the inner list may be <L>, instead of <L[2]…>. If the CarrierContentMap is unknown, the outer list length (NumberOfSlots) may be 0.
5114	DV	A [1..80]	CarrierID The Carrier ID.
5115	DV	U1	CarrierIDStatus Displays the Carrier ID Verification progress. Values are: 0 = ID NOT READ 1 = WAITING FOR HOST 2 = ID VERIFICATION OK 3 = ID VERIFICATION FAILED
5116	DV	A [0..80]	CarrierLocationID Shows the Carrier Location at which this carrier is currently located. If this Carrier Object represents a carrier that has not yet arrived at the equipment, CarrierLocationID will be zero-length. When a carrier is moving between two Locations, it is shown at the starting Location until the move is finished and after the move at the ending Location.

VID	Class	Format	Name and description
5117	DV	L	CarrierSlotMap Shows the status of each slot in the carrier. An ordered list, corresponding to Carrier Slots 1, 2, ..., n. Format is: <L [NumberOfSlots] <U1 SlotStatus> ... > Values for SlotStatus are: 1 = EMPTY. The slot contains no Substrate and is clear of obstructions. 2 = NOT EMPTY. The slot appears to contain some abnormal obstruction, but not a correctly-positioned Substrate. The SlotStatus values 4 (DOUBLE SLOTTED) and 5 (CROSS SLOTTED) can be considered more detailed sub-cases of this value, but some Slot Map reader hardware may not be able to distinguish among the sub-cases. 3 = CORRECTLY OCCUPIED. The slot contains a correctly positioned Substrate. 4 = DOUBLE SLOTTED. The slot abnormally contains two Substrates. 5 = CROSS SLOTTED. The slot contains a Substrate that is abnormally positioned, with one side of the Substrate in this slot and the other side in another slot. This equipment does not use the value (0 = Undefined). The set of values {2, 4, and 5} is collectively referred to as Abnormal. Equipment may remove a Substrate only from a slot whose SlotStatus is 3 (CORRECTLY OCCUPIED). Equipment may insert a Substrate only into a slot whose SlotStatus is 1 (EMPTY). Equipment should neither attempt to remove nor insert Substrates for slots whose SlotStatus is Abnormal. CarrierSlotMap values are assured correct only after CarrierSlotMapStatus is 2 (SLOT MAP VERIFICATION OK). Prior to this status, if the CarrierSlotMap is not yet known, the list length (NumberOfSlots) may be zero or different from CarrierCapacity.
5118	DV	U1	CarrierSlotMapStatus Shows the progress of Slot Map Verification for this carrier. Values are: 0 = SLOT MAP NOT READ 1 = WAITING FOR HOST 2 = SLOT MAP VERIFICATION OK 3 = SLOT MAP VERIFICATION FAILED

VID	Class	Format	Name and description
5119	DV	U1	`CarrierSubstrateCount` The number of Substrates currently contained in the carrier. `CarrierSubstrateCount` value is assured correct only after `CarrierSlotMapStatus` is `SlotMapVerificationOK` and `CarrierSubstrateCount` is equal to the number of `CarrierSlotMap` slots whose `SlotStatus` is `3 (CORRECTLY OCCUPIED)`. Prior to this status, if the `CarrierSlotMap` is not yet known, `CarrierSubstrateCount` may be zero-length.
5120	DV	A [`0..80`]	`CarrierUsage` The usage of the substrates contained in the carrier. If unknown, value is zero-length. Typical values are `PRODUCT`, `TEST`, `FILLER`, `CLEANING`, and so on.

5501	DV	L	`CarrierWID_Angle`
			
			This variable is meaningful only if the Equipment Constant `CfgWIDAngle` is set to `0x01`. When a carrier-related event occurs, this Variable contains the `CarrierWID_Angle` Attribute value from the current Carrier Object.
			
			Format is:
			
			`<L [NumberOfSlots]`
			`<U2 Angle1>`
			`<U2 Angle2>`
			`...`
			`>`

Current Carrier Location Data Variables

When a Carrier Location-related event occurs, the following Data Variables hold the attributes for the Carrier Location.

VID	Class	Format	Name and description
5131	DV	A [`0..80`]	`LocationCarrierID` The Carrier ID of the carrier located at this Location, if any. This is a zero-length value if there is no carrier present at this Location.
5132	DV	A [`1..80`]	`LocationID` The Carrier Location ID.

Carrier Location Status Variables

The following Status Variables are used with their corresponding Carrier Location.

Carrier Location 1 "LP1"

VID	Class	Format	Name and description
5612	SV	A [1..80]	LocationID1 The Carrier Location ID.
5613	SV	A [0..80]	LocationCarrierID1 The ID of the carrier at this Location, if any.

Carrier Location 2 "FIMS1"

VID	Class	Format	Name and description
5616	SV	A [1..80]	LocationID2 The Carrier Location ID.
5617	SV	A [0..80]	LocationCarrierID2 The ID of the carrier at this Location, if any.

Carrier Location 3 "LP2"

VID	Class	Format	Name and description
5632	SV	A [1..80]	LocationID3 The Carrier Location ID.
5633	SV	A [0..80]	LocationCarrierID3 The ID of the carrier at this Location, if any.

Carrier Location 4 "FIMS2"

VID	Class	Format	Name and description
5636	SV	A [1..80]	LocationID4 The Carrier Location ID.
5637	SV	A [0..80]	LocationCarrierID4 The ID of the carrier at this Location, if any.

Current Load Port Variables

The following variables are used with the current Load Port. When a Load Port-related event occurs, the following Data Variables hold the attributes for the Load Port.

VID	Class	Format	Name and description
5122	DV	U1	`PortID` The Load Port number. The left-most Load Port is `1`.

5123	DV	U1	`PortAccessMode`
			
			The current Access Mode for the Load Port.
			
			Values are:
			
			`0 = MANUAL (Operator)`
			`1 = AUTOMATIC (AMHS)`

5124	DV	U1	`PortAssociationState`
			
			Indicates whether this Load Port is currently associated with a Carrier.
			
			Values are:
			
			`0 = NOT ASSOCIATED`
			`1 = ASSOCIATED`

5125	DV	U1	`PortReservationState`
			
			Indicates whether this Load Port is currently Reserved.
			
			Values are:
			
			`0= NOT RESERVED`
			`1= RESERVED`

5126	DV	L	`PortStateInfo`
			
			A combination of `PortAssociationState` and `PortTransferState` status.
			
			Format is:
			
			`<L [2]`
			`  <U1 PortAssociationState>`
			`  <U1 PortTransferState>`
			`>`

VID	Class	Format	Name and description
5127	DV	U1	PortTransferState Indicates the current Transfer State of this Load Port. 0 = OUT OF SERVICE 1 = TRANSFER BLOCKED 2 = READY TO LOAD 3 = READY TO UNLOAD
5128	DV	U1	PortClampState Indicates whether the Load Port has a Carrier present and is clamped. Values are: 0 = UNCLAMPED – A Carrier may or may not be present. 1 = CLAMPED – A Carrier is present and clamped.

Load Port Status Variables

The following Status Variables are used with their corresponding Load Port.

Load Port 1

VID	Class	Format	Name and description
5603	SV	U1	PortAccessMode1 The current Access Mode for the Load Port. Values are: 0 = MANUAL (Operator) 1 = AUTO (AMHS)
5604	SV	U1	PortAssociationState1 Indicates whether this Load Port is associated with a carrier. Values are: 0 = NOT ASSOCIATED 1 = ASSOCIATED
5605	SV	U1	PortReservationState1 Indicates whether this Load Port is reserved. Values are: 0= NOT RESERVED 1= RESERVED
5606	SV	L	PortStateInfo1 A structure of Port Association State and Port Transfer State status, relating to Load Port 1. Format is: <L [2] <U1 PortAssociationState> <U1 PortTransferState> >
5607	SV	U1	PortTransferState1 Indicates the current Transfer State of the Load Port. Values are: 0 = OUT OF SERVICE 1 = TRANSFER BLOCKED 2 = READY TO LOAD 3 = READY TO UNLOAD

VID	Class	Format	Name and description
5608	SV	U1	PortClampState1 Indicates whether this Load Port currently has a carrier present and is clamped. Values are: 0 = UNCLAMPED – A carrier may or may not be present. 1 = CLAMPED – A carrier is present and clamped.

Load Port 2 (dual-port probers only)

VID	Class	Format	Name and description
5623	SV	U1	PortAccessMode2 The current Access Mode for the Load Port. Values are: 0 = MANUAL (Operator) 1 = AUTO (AMHS)
5624	SV	U1	PortAssociationState2 Indicates whether the Load Port is currently associated with a carrier. Values are: 0 = NOT ASSOCIATED 1 = ASSOCIATED
5625	SV	U1	PortReservationState2 Indicates whether this Load Port is reserved. Values are: 0= NOT RESERVED 1= RESERVED
5626	SV	L	PortStateInfo2 A structure of Port Association State and Port Transfer State status, relating to Load Port 2. Format is: <L [2] <U1 PortAssociationState> <U1 PortTransferState> >

VID	Class	Format	Name and description
5627	SV	U1	PortTransferState2 Indicates the current Transfer State of the Load Port. Values are: 0 = OUT OF SERVICE 1 = TRANSFER BLOCKED 2 = READY TO LOAD 3 = READY TO UNLOAD
5628	SV	U1	PortClampState2 Indicates whether this Load Port has a carrier present and is clamped. Values are: 0 = UNCLAMPED (a carrier might or might not be present) 1 = CLAMPED (a carrier is present and clamped)

Substrate Tracking Variables

The following variable is used for Substrate Tracking.

VID	Class	Format	Name and description
5503	DV	L	SubstWaferID When this equipment signals the event WaferIDRead, indicating that this equipment has read the physical Wafer ID from a Substrate, this variable contains data. Format is: <L [2] <U4 ReadStatus> <A [0..80] WaferID> > ReadStatus indicates the success or failure of the Wafer ID Read operation. Generally, a value of 0 indicates success and any non-zero value indicates a failure (an unreadable Wafer ID). If ReadStatus indicates success, then WaferID contains the Wafer ID which was read by this equipment's Wafer ID reader. Note that this value might or might not be identical to the Substrate Object ID. This variable is meaningful only if Equipment Constant CfgWIDAngle is set to 0x01.

VID	Class	Format	Name and description
8007	EC	Boolean [Default: FALSE]	SubstTypeInitToZero Initializes the SubstType, SubstUsage, and SubstMtrlStatus attributes to zero. TRUE = Initializes the SubstType, SubstUsage, and SubstMtrlStatus attributes to zero. FALSE = Attributes are not initialized and will be an empty integer until they are set with valid data.
8008	EC	Boolean [Default: FALSE]	BlockCapacitySlotMapMismatch Used to block Host S3F17 messages if the Capacity in the message is inconsistent with either the Slotmap size or Contentmap size specified within the Host message. TRUE = ConX300 will return an error within the S3F18 response if Capacity is inconsistent with either Slotmap size or ContentMap size. FALSE = Any inconsistencies between Capacity and Slotmap size and Contentmap size will be ignored.
8106	EC	U1 [Default: 0]	HideBatchLocAttributes Controls whether attributes associated with batch processing are visible for Substrate objects. Values are: 0 - Batch Processing attributes are visible for Substrate objects. 1 - The attributes BatchLocID and SubstPosInBatch will be hidden. If this value is selected, you should also mark BatchLocID and SubstPosInBatch as private in the GCD file.

Current Substrate Data Variables

When a Substrate-related event occurs, the following Data Variables hold the attributes for the Substrate Object.

VID	Class	Format	Name and description

5201	DV	L	`Substrate`
			
			The current Substrate Object. When a Substrate-related event occurs, this variable contains the entire related (current) Substrate Object.
			
			Format is:
			
			`<L [NumberOfAttributes]`
			`  <L [2]`
			`  <A "ObjType">`
			`  <A "Substrate">`
			`  >`
			`  <L [2]`
			`  <A "ObjID">`
			`  <A SubstrateID>`
			`  >`
			`  <L [2]`
			`  <A AttributeName>`
			`  <AttributeValue>`
			`  >`
			`  …`
			`>`

5202	DV	A [`0..80`]	`SubstLotID` Identifier of the Lot associated with this substrate. If unknown, the value is zero-length.
5203	DV	U1	`SubstMtrlStatus` Equipment-defined values indicating the criteria of processing quality of the Substrate. If unknown, the value is zero-length.
5204	DV	A [`1..80`]	`SubstId` The Substrate identifier.
5205	DV	A [`0..80`]	`SubstDestination` The Substrate Location ID on which the Substrate shall be finally restored. If zero-length, then `SubstDestination` is implicitly the same as `SubstSource`.

VID	Class	Format	Name and description
5206	DV	L	SubstHistory Ordered list of three-element lists showing the current history of the substrate movement inside the equipment. Format is: <L [NumberOfHistoryRecords] <L [3] <A [1..80] SubstLocID or BatchLocID.SubstPosInBatch> <A [16] TimeIn> <A [16] TimeOut> > ... > TimeIn and TimeOut are in format YYYYMMDDhhmmsscc and show the date and time the Substrate entered and left that Location. The first entry is the SubstSource. For a Substrate that is in process, the last entry shown will have a zero-length TimeOut. For a completed Substrate, the last entry is the SubstDestination, and its TimeOut is zero-length.
5207	DV	A[1..80]	SubstLocID [SEMI E90: SubstSubstLocID] The Substrate Location where this Substrate currently resides. Undefined if Substrate currently resides in a Batch Location.
5208	DV	U1	SubstProcState The current Processing State of the Substrate. Values are: 0 = NEEDS PROCESSING 1 = IN PROCESS 2 = PROCESSED 3 = ABORTED 4 = STOPPED 5 = REJECTED 6 = LOST 7 = SKIPPED
5209	DV	U1	SubstState The Transport state of this Substrate. 0 = AT SOURCE 1 = AT WORK 2 = AT DESTINATION
5210	DV	A [1..80]	SubstSource The starting Substrate Location for the current Substrate.

VID	Class	Format	Name and description
5211	DV	U1	SubstType The Substrate type. Values are: 0 = WAFER 1 = FLAT PANEL 2 = COMPACT DISC 3 = MASK OR RETICLE If unknown, value is zero-length.
5212	DV	U1	SubstUsage The usage of the Substrate. Standard values are: 0 = PRODUCT 1 = TEST 2 = FILLER 3 = CLEANING Other values may be factory specific. If unknown, value is zero-length.
5213	DV	A [0..80]	SubstBatchLocID When a Substrate-related Event occurs, this Variable contains the SubstBatchLocID Attribute value from the related (current) Substrate Object. SubstBatchLocID identifies the Substrate Batch Location within the Equipment where the Substrate Batch resides.
5214	DV	A [1..80]	SubstPosInBatch The position in the Batch Location where the Substrate currently resides. The value is undefined if the Substrate currently resides at a Substrate Location.
5230	DV	L	SubstIDList Contains an ordered list of Substrate IDs (A[1..80]) associated with a Substrate-related Group State Model Transition Collection Event.
5231	DV	L	SubstStateList Contains an ordered list of Substrate States (U1) associated with a Substrate-related Group State Model Transition Collection Event.
5232	DV	L	SubstProcStateList Contains an ordered list of Substrate Processing states (U1) associated with a Substrate-related Group State Model Transition Collection Event.
5233	DV	L	SubstLocIDList Contains an ordered list of Substrate LocationIDs (A[1..80]) associated with a Substrate-related Group State Model Transition Collection Event.

VID	Class	Format	Name and description
5502	DV	U2	SubstWID_Angle When a substrate-related event occurs, this variable contains the SubstWID_Angle attribute value from the related (current) Substrate Object. Format is: <U2 Angle> This variable is meaningful only if the Equipment Constant CfgWIDAngle is set to 0x01.
8206	DV	L	AcquiredIDList Contains an ordered list of AcquiredIDs (A[0..80]) associated with a Substrate-related Group State Model Transition Collection Event.
8207	DV	L	SubstBatchLocIDList Contains an ordered list of Batch LocationIDs (A[0..80]) associated with a Substrate-related Group State Model Transition Collection Event.
8208	DV	L	SubstDestinationList Contains an ordered list of Destination Location IDs (A[0..80]) associated with a Substrate-related Group State Model Transition Collection Event.
8209	DV	L	SubstHistoryList Contains an ordered list of Substrate Histories (L) associated with a Substrate-related Group State Model Transition Collection Event.
8210	DV	L	SubstIDStatusList Contains an ordered list of SubstIDStatus values associated with a Substrate-related Group State Model Transition Collection Event.
8211	DV	L	SubstLotIDList Contains an ordered list of Substrate Lot IDs (A[0..80]) associated with a Substrate-related Group State Model Transition Collection Event.
8212	DV	L	SubstMtrlStatusList Contains an ordered list of Substrate Material status (U1) associated with a Substrate-related Group State Model Transition Collection Event.
8213	DV	L	SubstPosInBatchList Contains an ordered list of Substrate Positions in Batch Location (U1) associated with a Substrate-related Group State Model Transition Collection Event.
8214	DV	L	SubstSourceList Contains an ordered list of Source Location IDs (A[1..80]) associated with a Substrate-related Group State Model Transition Collection Event.

VID	Class	Format	Name and description
8215	DV	L	SubstTypeList Contains an ordered list of Substrate Types (U1) associated with a Substrate-related Group State Model Transition Collection Event.
8216	DV	L	SubstUsageList Contains an ordered list of Substrate Usages (U1) associated with a Substrate-related Group State Model Transition Collection Event.

Current Substrate Location Data Variables

When a Substrate Location-related event occurs, the following Data Variables hold the attributes for the Substrate Location Object.

VID	Class	Format	Name and description
5220	DV	L	SubstLoc When a substrate Location-related event occurs, this variable contains the entire related (current) Substrate Location object. Format is: <L [NumberOfAttributes] <L [2] <A "ObjType"> <A "SubstLoc"> > <L [2] <A "ObjID"> <A SubstLoc> > <L [2] <A AttributeName> <AttributeValue> > ... >
5221	DV	A [0..80]	SubstLocSubstID The identifier of the Substrate that currently resides at this Substrate Location if there is one.
5222	DV	A [1..80]	SubstLocSubstLocID The identifier of the Substrate Location.
5223	DV	U1	SubstLocSubstLocState Shows whether this Location is occupied by a Substrate. Values are: 0 = UNOCCUPIED 1 = OCCUPIED

VID	Class	Format	Name and description
8217	DV	Boolean	SubstLocDisableEvents Indicates whether this Substrate Location reports events to the Host. Values are: TRUE = Disable Event Reporting FALSE = Enable Event Reporting

Substrate Location Status Variables

The following Status Variables are used with their Substrate Location.

Substrate Location 1 "Pre-Chuck"

VID	Class	Format	Name and description
5711	SV	A [0..80]	SubstLocSubslID1 The identifier of the Substrate that currently resides at this Substrate Location, if any.
5712	SV	A [1..80]	SubstLocSubstLocID1 The identifier of the Substrate Location.
5713	SV	U1	SubstLocSubstLocState1 Shows whether this Location is occupied by a Substrate. Values are: 0 = UNOCCUPIED 1 = OCCUPIED
8222	SV	Boolean	SubstLocDisableEvents1 The Event Reporting Status of Substrate Location. This variable shows the Event Reporting attribute of this Substrate Location. This indicates whether Events for the Substrate Location should be sent to the Host. Values are: TRUE = Disable Event Reporting FALSE = Enable Event Reporting

Substrate Location 2 "Chuck"

VID	Class	Format	Name and description
5721	SV	A [0..80]	SubstLocSubstID2 The identifier of the Substrate that currently resides at this Substrate Location, if any.

VID	Class	Format	Name and description
5722	SV	A [1..80]	SubstLocSubstLocID2 The identifier of the Substrate Location.
5723	SV	U1	SubstLocSubstLocState2 Shows whether this Location is occupied by a Substrate. Values are: 0 = UNOCCUPIED 1 = OCCUPIED
8223	SV	Boolean	SubstLocDisableEvents2 The Event Reporting Status of Substrate Location. This variable shows the Event Reporting attribute of this Substrate Location. This indicates whether Events for the Substrate Location should be sent to the Host. Values are: TRUE = Disable Event Reporting FALSE = Enable Event Reporting

Substrate Location 3 "Post-Chuck"

VID	Class	Format	Name and description
5731	SV	A [0..80]	SubstLocSubstID3 The identifier of the Substrate that currently resides at this Substrate Location, if any.
5732	SV	A [1..80]	SubstLocSubstLocID3 The identifier of the Substrate Location.
5733	SV	U1	SubstLocSubstLocState3 Shows whether this Location is occupied by a Substrate. 0 = UNOCCUPIED 1 = OCCUPIED
8224	SV	Boolean	SubstLocDisableEvents3 The Event Reporting Status of Substrate Location. This variable shows the Event Reporting attribute of this Substrate Location. This indicates whether Events for the Substrate Location should be sent to the Host. Values are: TRUE = Disable Event Reporting FALSE = Enable Event Reporting

Control Job Management Variables

The following variables are used for Control Job Management.

VID	Class	Format	Name and description
5401	EC	U2 [Default: 2]	CtrlMaxJobSpace This limits the maximum number of Control Jobs that the equipment allows in the QUEUED state at any moment. This constant directly affects the QueueAvailableSpace count of how many control jobs may be added to the current queue.
5402	SV	L	QueuedCJobs A list of all queued Control Jobs. The list is in queue order with HeadOfQueue first. Format is: <L [NumberOfQueuedControlJobs] <A CtrlJobID> /* HOQ*/ <A CtrlJobID> ... >
5403	SV	U2	QueueAvailableSpace Indicates how many additional Control Jobs the host can create at this time. The equipment computes this value as the maximum, as per the Equipment Constant CtrlMaxJobSpace, less the count of existing Control Jobs whose state is QUEUED. The equipment will reject any host attempt to create a Control Job when QueueAvailableSpace is 0.
5404	EC	A [0..80]	SetUpName The host can set any value for this variable. It has no effect on this equipment.
5405	EC	U4 [Default: 0]	CtrlJobPersistTime Units are measured in seconds of time. The equipment will retain a control job object whose state is COMPLETED for this specified time before the equipment destroys the control job object. This Equipment Constant provides compatibility with E94-1000 and earlier. For compatibility with E94-0302 and later, set this Equipment Constant to 0.

VID	Class	Format	Name and description
5406	EC	U1 [Default: 0]	CFGS16F28 AN EQUIPMENT CONSTANT THAT ALLOWS THE ECS TO CHOOSE WHICH S16F28 CONTROL JOB COMMAND ACKNOWLEDGE FORMAT SHOULD BE RECEIVED FROM CONX300. VALUES ARE: 0 = Semi standard format for S16F28 message. 1 = Non-standard format with outer number of errors lists.
8006	EC	Boolean: [Default: FALSE]	DisablePJCJPersistence Enables support for versions of SEMI E40 prior to 0705 (disabling support for versions 0705 and later). This disables Process Job / Control Job persistence mandated by SEMI E40-0705 and SEMI E94-0306. TRUE = Process Job/Control Job persistence is disabled. FALSE or not provided = Process Job/Control Job persistence is enabled. 0 = FALSE Value other than 0 = TRUE Note that this EC is also listed under Process Job GEM Variables.
8010	EC	Boolean: [Default: FALSE]	CJPJTerminationRejectOption Allows the ECS to reject certain Control Job / Process Job note calls. TRUE = Allows the ECS to reject NoteCtrlJobCancelled, NoteCtrlJobStop, NoteCtrlJobAbort, NotePRJobCancel, NotePRJobStop, and NotePRJobAbort calls when a S16F5 or a S16F27 message is received from the Host. FALSE = The return code of the above Note Calls will be ignored.

Current Control Job Data Variables

When a Control Job-related event occurs, the following Data Variables hold the attributes for the Control Job.

VID	Class	Format	Name and description
5411	DV	L	CtrlJob The current Control Job Object. When a Control Job-related Event occurs, this Variable contains the entire related (current) Control Job Object. The value <U1 0> has no purpose, except to satisfy GCD syntax rules. The actual format of the Variable is: <L [NumberOfAttributes] <L [2] <A "ObjType"> <A "CtrlJob"> > <L [2] <A "ObjID"> <A CtrlJobID> > <L [2] <A AttributeName> <AttributeValue> > … >
5412	DV	L	CtrlJobCarrierInputSpec This equipment determines the carriers required for the control job by examining the process jobs. For future planning, future versions of this equipment may support the following format: <L [NumberOfCarriers] <A CarrierID> ... > A list of CarrierIDs for the material that will be used by this Control Job.

VID	Class	Format	Name and description
5413	DV	L	CtrlJobCurrentPrJob A list of all Process Jobs within this Control Job whose PrJobState is ACTIVE (any substate). Format is: <L [NumberOfPjobs] <A [1..80] PrJobID> ... > This variable may be zero-length.
5414	DV	A [0..80]	CtrlJobDataCollectionPlan The identifier for a data collection plan to be used during execution of this Control Job. May be zero-length, indicating no Data Collection plan.
5415	DV	L	CtrlJobMtrlOutByStatus Specifies carrier substrate Locations where processed material will be placed based on Material Status (see Substrate Object MaterialStatus (on page 2-7)). Format is: <L [NumberOfStatuses] <L [2] <U1 MaterialStatus> <L [2] <A CarrierID> <L [NumberOfSlots] <U1 SlotID> ... /*More SlotIDs*/ > > > ... /*More MaterialStatuses*/ > If NumberOfSlots is 0, the equipment may output Substrates to any available SlotID in the specified carrier.

VID	Class	Format	Name and description

5416	DV	L	`CtrlJobMtrlOutSpec`
			
			Maps material from source to destination after processing. If the variable is zero-length, Substrates are returned to their starting Locations.
			
			Format is:
			
			`<L [NumberOfMaps]`
			`  <L [2]`
			`  <L [2]  /* Source Map */`
			`  <A CarrierID>`
			`  <L [NumberOfSlotsSource]`
			`  <U1 SlotID>`
			`  ... /* More Slots */`
			`  >`
			`  >`
			`  <L [2]  /* Destination Map */`
			`  <A CarrierID>`
			`  <L [NumberOfSlotsDest]`
			`  <U1 SlotID>`
			`  ... /* More Slots */`
			`  >`
			`  >`
			`  >`
			`  ...  /* More Maps */`
			`>`
			
			If `NumberOfMaps = 0`, then the destination of each wafer is the same as its source Location.

5417	DV	L	`CtrlJobPauseEvent`
			
			A list of events that will cause the current job to pause. This variable may be zero-length.
			
			Format is:
			
			`<L`
			`  <U4 CEID>`
			`...`
			`>`

VID	Class	Format	Name and description
5418	DV	L	CtrlJobProcessingCtrlSpec Defines the Process Jobs that will be run within this Control Job, as well as the rules for running each. NumberOfPjobs must be 1 or greater. Format is: <L [NumberOfPjobs] <L [3] <A PrJobID> <L [NumberOfControlRules] <L [2] /* Control Rule */ <A [1..80] RuleName> <RuleValue> > .../* More Control Rules */ <L [NumberOfOutputRules] <L [2] <U1 MaterialStatus <ThresholdValue> > ... /* More Output Rules */ > > ... /* More Process Jobs */ > NumberOfControlRules may be 0 (no Control Rules for this Process Job). NumberOfOutputRules may be 0 (no Output Rules for this Process Job). For this equipment, the formats of Control Rules and Output Rules are not validated. The equipment might ignore them.
5419	DV	U1	CtrlJobProcessOrderMgmt Specifies the method for the order in which Process Jobs are initiated within this Control Job. Values are: 1 = ARRIVAL. Process Jobs whose material has arrived at the equipment are initiated in the order specified in CtrlJobProcessingCtrlSpec. Process Jobs whose material has not yet arrived remain pooled until it arrives. 2 = OPTIMIZE. The equipment chooses the "best" method. 3 = LIST. Process jobs are initiated in the order specified in CtrlJobProcessingCtrlSpec.

VID	Class	Format	Name and description
5420	DV	Boolean	CtrlJobStartMethod Specifies whether this job starts automatically or waits for a User Start, such as a host S16F27 Start command or an equivalent local operator command. Values are: TRUE = AUTOMATIC START FALSE = USER START
5421	DV	U1	CtrlJobState Current State of the Control Job. Values are: 0 = QUEUED 1 = SELECTED 2 = WAITING FOR START 3 = EXECUTING 4 = PAUSED 5 = COMPLETED
5422	DV	A [1..80]	CtrlJobID The Control Job identifier.
5423	DV	L	CtrlJobPRJobStatusList A list of all Process Jobs managed by the current Control Job and their associated statuses.

Process Job Management Variables

The following variables are used for Process Job Management.

VID	Class	Format	Name and description
5301	EC	U2 [Default is 50]	PRMaxJobSpace Limits the maximum number of Process Jobs that the equipment allows at a time.
5302	EC	U1 [Default is 0]	E40PrJobStateValues Controls the format that this Equipment uses for values of the Process Job attribute PrJobState. It is provided for compatibility with legacy hosts. 0 = SEMI E40-0705 and later. PrJobState values are: 0 = QUEUED/POOLED 1 = SETTING UP 2 = WAITING FOR START 3 = PROCESSING 4 = PROCESS COMPLETE 5 = RESERVED 6 = PAUSING 7 = PAUSED 8 = STOPPING 9 = ABORTING 10 = STOPPED 11 = ABORTED 1 = Legacy Formats, pre-SEMI E40-0705. PrJobState values are: 0 = QUEUED/POOLED 1 = SETTING UP 2 = WAITING FOR START 3 = PROCESSING 4 = PROCESS COMPLETE 5 = PAUSING 6 = PAUSED 7 = STOPPING 8 = ABORTING
5303	EC	U1 [Default is 3]	PRMtrlOrder Defines the order in which the material in the Process Job Material List is done. Values are: 1 = ARRIVAL. Process the material that arrives first. 2 = OPTIMIZE. Process the material in an order that maximizes throughput. 3 = LIST. Processes the material in the order specified in the material list.

VID	Class	Format	Name and description
5304	EC	U1 [Default is 0]	PRJobCancelAction An optional constant with a default value of 0. Possible values are: 0 = PRJOB_IGNORE. No special action will be taken on the control job, standard behavior is applied. 1 = PRJOB_ALWAYSSTOPREMOVEQUEUED. The control job will be stopped, any queued process jobs will be removed. 2 = PRJOB_ALWAYSSTOPLEAVEQUEUED. The control job will be stopped, any queued process jobs will be maintained. 3 = PRJOB_ALWAYSABORTREMOVEQUEUED. The control job will be aborted, any queued process jobs will be removed. 4 = PRJOB_ALWAYSABORTLEAVEQUEUED. The control job will be aborted, any queued process jobs will be maintained. 5 = PRJOB_LASTSTOP. The control job will be stopped if the process job is the last one. 6 = PRJOB_LASTABORT. The control job will be aborted if the process job is the final one.
5305	EC	U1 [Default is 0]	PRJobStopAction An optional constant with a default value of 0. Possible values are: 0 = PRJOB_IGNORE. No special action will be taken on the control job, standard behavior applied. 1 = PRJOB_ALWAYSSTOPREMOVEQUEUED. The control job will be stopped, any queued process jobs will be removed. 2 = PRJOB_ALWAYSSTOPLEAVEQUEUED. The control job will be stopped, any queued process jobs will be maintained. 3 = PRJOB_ALWAYSABORTREMOVEQUEUED. The control job will be aborted, any queued process jobs will be removed. 4 = PRJOB_ALWAYSABORTLEAVEQUEUED. The control job will be aborted, any queued process jobs will be maintained. 5 = PRJOB_LASTSTOP. The control job will be stopped if the process job is the last one. 6 = PRJOB_LASTABORT. The control job will be aborted if the process job is the final one.
8006	EC	Boolean [Default: FALSE]	DisablePJCJPersistence Enables support for versions of SEMI E40 prior to 0705 (disabling support for versions 0705 and later). This disables Process Job/Control Job persistence mandated by SEMI E40-0705 and SEMI E94-0306. When TRUE, Process Job/Control Job persistence is disabled. When FALSE or not provided, Process Job/Control Job persistence is enabled. 0 = FALSE Value other than 0 = TRUE Note that this EC is also listed under Control Job GEM Variables.

VID	Class	Format	Name and description
8012	EC	Boolean [Default: FALSE]	PRJobSetupOption When TRUE, NotePrJobSetup for the Process Job will be received after all material is associated. TRUE = NotePrJobSetup for Process Job will be received only after all material is associated FALSE = Old functionality is maintained: NotePrJobSetup for Process Job will be received even if not all material is associated.

Current Process Job Data Variables

When a Process Job- related event occurs, the following Data Variables hold the attributes for the Process Job.

VID	Class	Format	Name and description
5311	DV	L	PRJob The current Process Job Object. When a Process Job-related Event occurs, this Variable contains the entire related (current) Process Job Object. The value <U1 0> has no purpose, except to satisfy GCD syntax rules. The format of the Variable is: <L [NumberOfAttributes] <L [2] <A "ObjType"> <A "PRJob"> > <L [2] <A "ObjID"> <A PRJobID> > <L [2] <A AttributeName> <AttributeValue> > … >
5312	DV	L	PauseEvent A list of events which will cause this job to pause. The list must be zero-length for this equipment. Format is: <L>
5313	DV	A [1..80]	PRJobId The Process Job identifier.

VID	Class	Format	Name and description

5314	DV	U1	PRJobState
			
			The Process State of the Job. Equipment constant `E40PrJobState` values can be set to support current or legacy values.
			
			Enumerated:
			
			`0` = SEMI E40-0705 and later. `PrJobState` values are:
			`0` = `QUEUED/POOLED`
			`1` = `SETTING UP`
			`2` = `WAITING FOR START`
			`3` = `PROCESSING`
			`4` = `PROCESS COMPLETE`
			`5` = `RESERVED`
			`6` = `PAUSING`
			`7` = `PAUSED`
			`8` = `STOPPING`
			`9` = `ABORTING`
			`10` = `STOPPED`
			`11` = `ABORTED`
			
			`1` = Legacy Formats, pre-SEMI E40-0705. `PrJobState` values are:
			`0` = `QUEUED/POOLED`
			`1` = `SETTING UP`
			`2` = `WAITING FOR START`
			`3` = `PROCESSING`
			`4` = `PROCESS COMPLETE`
			`5` = `PAUSING`
			`6` = `PAUSED`
			`7` = `STOPPING`
			`8` = `ABORTING`

VID	Class	Format	Name and description
5315	DV	L	PRMtlNameList A list of the material to be processed by this job. If PrMtlType specifies a carrier, format is: <L [NumberOfCarriers] <L [2] <A CarrierID> <L [NumberOfSlots] <U1 SlotID> ... /* More SlotIDs */ > > ... /* More Carriers */ > NumberOfSlots should be greater than 0. If PrMtlType specifies substrate, the format is: <L [NumberOfSubstrates] <A SubstrateID> ... /* More Substrates */ > NumberOfSubstrates should be greater than 0. If the process job has no material, the format is: <L>
5316	DV	B	PRMtlType The units of material specified. This equipment ignores any value set by the host when it creates the job. Instead, this equipment deduces the Material units from the PrMtlNameList and forces PrMtlType to one of the following values: <B 0x0D> = Carrier <B 0x0E> = Substrate <B> = No Material in this Process Job
5317	DV	Boolean	PRProcessStart Specifies whether the job starts automatically or waits for a User Start (host S16F5 Start command or equivalent local operator command). Values are: TRUE = AUTOMATIC START FALSE = MANUAL START

VID	Class	Format	Name and description
5318	DV	U1	PRRecipeMethod Indicates whether Recipe Variables are used. This Equipment ignores any value set by the Host when it creates the job. Instead this Equipment forces its value to be consistent with RecVariableList, as one of the values: 1 = Recipe only 2 = Recipe with variable tuning
5319	DV	A [1..80]	RecID Identifier of the Recipe or Process Program to be used with this Process Job.
5320	DV	L	RecVariableList Recipe variables. Format is: <L [NumberOfVariables] <L [2] <A [1..80] RCPPARNM> <RCPPARVAL> > ... > RCPPARVAL format may be any of {B, BOOLEAN, A, Ix, Ux, Fx} The values specified override nominal values in the Process Program or Recipe. The RCPPARNM and RCPPARVAL values depend on the nature of the Process Program or Recipe specified in RecID.

Equipment performance tracking variables

The following variables are used for equipment tracking.

VID	Class	Format	Name and description
6107 6207 6307	EC	A [0...80]	EPTElementNameᵢ A name for this object which may be set by the factory host.

Global data variables for the EPT object

The following variables are used for the EPT object.

VID	Class	Format	Name and description
6950	DV	U1	NumBusy Number of BUSY Production EPT modules on the equipment. Excludes EFEM/LoadPort EPT Modules.
6951	DV	U1	NumIdle Number of IDLE Production EPT modules on the equipment. Excludes EFEM/LoadPort EPT Modules.
6952	DV	U1	NumBlocked Number of BLOCKED Production EPT modules on the equipment. Excludes EFEM/LoadPort EPT Modules.

Current EPT object definition

The following variables define the current EPT object.

VID	Class	Format	Name and description
6900	DV	U1	EPTTracker This variable contains the entire EPT Tracker Object
6901	DV	A[1..80]	EPTID This variable is the EPTID attribute for the current EPT Object.
6902	DV	U1	BlockedReason A code that identifies the reason this EPT Object is blocked. Enumerated. This code is only important for EPT state transitions 5, 8, and 9. For other transitions the value is 0 (Not Blocked).
6903	DV	A[0..80]	BlockedReasonText Text that identifies the reason this Object is blocked. May provide further details to BlockedReason. When BlockedReason is 0 (Not Blocked), this value is <A[0]> (zero-length).
6904	DV	U1	EPTElementType Type of this EPT Module. Enumerated: 0 = Equipment 1 = Production EPT Module 2 = EFEM/LoadPort EPT Module

VID	Class	Format	Name and description
6905	DV	U1	`EPTState` The EPT object's current EPT State. Enumerated: `0` = Idle `1` = Busy `2` = Blocked `3` = No state
6906	DV	U4	`EPTStateTime` Provides the amount of time, in seconds, spent in the previous EPTO state.
6907	DV	A[`0..80`]	`EPTElementName` A name for this EPT object that may be set by the factory host by setting the corresponding attribute `EPTElementNamei`.
6908	DV	U1	`PreviousEPTState` The previous EPT State for the EPT object. Enumerated: `0` = Idle `1` = Busy `2` = Blocked `3` = No state (Power Up)
6909	DV	A[`0..80`]	`PreviousTaskName` The previously running EPT Task. When `PreviousTaskType` is `0`, this value is <A[`0`]> (zero-length).
6910	DV	U1	`PreviousTaskType` The previously running EPT Task type. Enumerated: `0` = No task `1` = Unspecified `2` = Process - adding value (example: exposing) `3` = Support - incapable of adding value (example: handling or transport) `4` = Equipment Maintenance (example: equipment-initiated clean cycle) `5` = Equipment Diagnostics (example: equipment-initiated health check) `6` = Waiting
6911	DV	A[`0..80`]	`TaskName` The current EPT Task. When `TaskType` is `0`, this value is <A[`0`]> (zero-length).

VID	Class	Format	Name and description
6912	DV	U1	TaskType Defines the type for the running EPT Task. Enumerated: 0 = No task 1 = Unspecified 2 = Process - adding value (example: exposing) 3 = Support - incapable of adding value (example: handling or transport) 4 = Equipment Maintenance (example: equipment-initiated clean cycle) 5 = Equipment Diagnostics (example: equipment-initiated health check) 6 = Waiting
6913	DV	A[0..16]	TransitionTimestamp Timestamp when the most recent transition and its related event occurred, triggering this EPT Object to its current state.
6914	DV	U1	Transition The most recent transition that updated this EPT object. Enumerated: TRANSITION_1 = 1 TRANSITION_2 = 2 TRANSITION_3 = 3 TRANSITION_4 = 4 TRANSITION_5 = 5 TRANSITION_6 = 6 TRANSITION_7 = 7 TRANSITION_8 = 8 TRANSITION_9 = 9
6915	DV	U4	TrackerEventID Numeric Identifier for the event (CEID) that is triggered for a change in the state model for this EPT object.
6920	DV	A[0..32]	EPTClock EPTClock gives transition time for the last EPT state transition. The clock represents the timestamp for the occurrence of the event. The format of EPTClock is controlled by the GemTimeFormat EC. If GemTimeFormatEC is set to: 0, the time will be in the 12-byte format YYMMDDhhmmss 1, the time will be in the 16-byte format YYYYMMDDhhmmsscc 2, and the GemE50308 EC is set to 1, the time will be in the max 32-byte format YYYY-MM-DDThh:mm:ss.sTZD

VID	Class	Format	Name and description
8205	DV	L	DisableEventOnTransition A list of transitions that will not be reported as events to the Host. List can be from 0 to all 9 transitions. Format: <L <U1 TRANSITIONi> ... >

EPT Object (0, 1, 2, ...) variables

The following variables are used with EPT objects.

VID	Class	Format	Name and description
6002 6102 6202 6302	SV	U1	BlockedReason$_i$ A code that identifies the reason this object is blocked. Enumerated: 0 = Not Blocked 1 = Unknown 2 = Safety Threshold 3 = Error Condition 4 = Parametric Exception 5 = Aborting, Aborted 6 = Pausing, Paused 7 = Reserved 8 = Reserved 9 = Reserved Important only if the most recent EPT state transition was 5, 8, or 9. For other transitions the value is 0 (Not blocked).
6003 6103 6203 6303	SV	A [0..80]	BlockedReasonText$_i$ Text that identifies the reason this object is blocked. May provide further details for BlockedReason. When BlockedReason1 is 0 (Not Blocked), this value is <A[0]> (zero-length).
8218 8219 8220 8221	SV	L	DisableEventOnTransition$_i$ A collection of transitions that will not be reported as a Host Event when they occur as part of EPTTracker operations. The list can be from 0 to 9 transitions. Format is: <L <U1 TRANSITIONi> ... >

VID	Class	Format	Name and description
6004 6104 6204 6304	SV	U1	EPTElementType$_i$ Type of this EPT object. Enumerated: 0 = Equipment 1 = Production EPT Module 2 = EFEM/LoadPort EPT Module
6005 6105 6205 6305	SV	U1	EPTState$_i$ The current EPT State for this EPT object. Enumerated: 0 = Idle 1 = Busy 2 = Blocked 3 = No State
6006 6106 6206 6306	SV	U4	EPTStateTime$_i$ Time in seconds spent in the previous EPT State, prior to entering the current EPTState.
6008 6108 6208 6308	SV	U1	PreviousEPTState$_i$ The previous EPT State for this EPT object, prior to entering the current EPTState. Enumerated: 0 = Idle 1 = Busy 2 = Blocked 3 = No State (Power Up)
6009 6109 6209 6309	SV	A[0..80]	PreviousTaskName$_i$ The name of the EPT Task previously running on this EPT object, prior to starting the current EPT Task. When PreviousTaskType1 is 0, this value is <A[0]> (zero-length).
6010 6110 6210 6310	SV	U1	PreviousTaskType$_i$ Type of the EPT Task previously running on this EPT object, prior to starting the current EPT Task. Enumerated: 0 = No Task 1 = Unspecified 2 = Process - adding value (example: exposing) 3 = Support -- incapable of adding value (example: handling or transport) 4 = Equipment Maintenance (example: equipment-initiated clean cycle) 5 = Equipment Diagnostics (example: equipment-initiated health check) 6 = Waiting

VID	Class	Format	Name and description
6011 6111 6211 6311	SV	A[0..80]	TaskName$_i$ Name of the EPT Task currently running on this EPT object. When TaskType1 is 0, this value is <A[0]> (zero-length).
6012 6112 6212 6312	SV	U1	TaskType$_i$ The current EPT Task type. Enumerated: 0 = No Task 1 = Unspecified 2 = Process - adding value (example: exposing) 3 = Support - incapable of adding value (example: Handling or Transport) 4 = Equipment Maintenance (example: Equipment-initiated clean cycle) 5 = Equipment Diagnostics (example: Equipment-initiated health check) 6 = Waiting
6013 6113 6213 6313	SV	A[0..16]	TransitionTimestamp$_i$ The most recent transition and related event's timestamp.
6014 6114 6214 6314	SV	U1	Transition$_i$ The most recent transition that updated this EPT object. Enumerated: TRANSITION_1 = 1 TRANSITION_2 = 2 TRANSITION_3 = 3 TRANSITION_4 = 4 TRANSITION_5 = 5 TRANSITION_6 = 6 TRANSITION_7 = 7 TRANSITION_8 = 8 TRANSITION_9 = 9
6015 6115 6215 6315	SV	I4	TrackerEventIDi ID for the event (CEID) that triggered a change in the state model.

E30 GEM Variables

The following are GEM variables supported by the equipment.

VID	Class	Format	Name and description
1	EC	U1 [Default: 0]	ConfigAlarms Specifies the type of message used for reporting alarms: 0 = S5F1 (GEM compliant) 1 = S5F71 (non-GEM) 2 = S5F73 (non-GEM)
2	EC	U1 [Default: 2]	ConfigConnect Specifies the type of message used for establishing communications: 0 = S1F1 (non-GEM) 1 = S1F65 (non-GEM) 2 = S1F13 (GEM compliant)
3	EC	U1 [Default: 1]	ConfigEvents Specifies the type of message used for reporting events: 0 = S6F3/S6F9 (non-GEM) 1 = S6F11/S6F13 (GEM compliant)
5	EC	A	DeviceName Specifies the equipment name. Initial value is Keithley Parametric Test System.
6	EC	U2 [Default: 20]	EstablishCommunicationsTimeout Specifies how often to attempt to establish communications with the host. Valid range is 0 to 1800 seconds. A value of 0 disables the attempts.
8	EC	U1 [Default: 1]	InitCommState Specifies the initial Communication State on power up: 0 = Disabled 1 = Enabled
9	EC	U1 [Default: 2]	InitControlState Specifies the initial Control State at power-up: 1 = OFF-LINE 2 = ON-LINE
10	EC	U2 [Default: 30]	HeartBeat Specifies how often to send S1F1 heartbeat: 0 to 1800 seconds. (0 = no heartbeat)
17	EC	Boolean [Default: FALSE]	RpType Specifies how the equipment will report events: TRUE = S6F3 or S6F13 (annotated) FALSE = S6F9 or S6F11 (normal)

VID	Class	Format	Name and description
18	EC	U1 [Default: 1]	WBitS10 Specifies whether to send stream 10 (text) messages with or without W-bit set: 0 = W-bit cleared 1 = W-bit set
19	EC	U1 [Default: 1]	WBitS5 Specifies whether to send a stream 10 (alarm) messages with or without W-bit set: 0 = W-bit cleared 1 = W-bit set
20	EC	U1 [Default: 1]	WBitS6 Specifies whether to send a stream 6 (event) messages with or without W-bit set: 0 = W-bit cleared 1 = W-bit set
21	SV	U1 [Default: 0]	AbortLevel Aborts level.
22	DV	U4	AlarmID ALID of the alarm which caused the latest transition.
23	SV	L	AlarmsEnabled A list of each alarm (ALID) that is currently enabled.
24	SV	L	AlarmsSet A list of each alarm (ALID) that is currently ON.
25	SV	U1 [Default: 0]	AlarmState Identifies if the last alarm message was a transition with ON or OFF: 0 = ON to OFF 1 = OFF to ON
26	SV	U4 [Default: 0]	AlarmSerial A running total of the number of alarm transitions that have occurred.
27	SV	A [16]	Clock Contains the host's view of the time and date on the equipment. Its format is: YYYYMMDDhhmmsscc.
28	SV	U1	ControlState Current Control State: 1 = OFF-LINE, EQUIPMENT OFF-LINE 2 = OFF-LINE, ATTEMPT ON-LINE 3 = OFF-LINE, HOST OFF-LINE 4 = ON-LINE, LOCAL 5 = ON-LINE, REMOTE

VID	Class	Format	Name and description
29	SV	U4	DataId Intended to contain some specific information about the data being sent in a particular message.
30	SV	L	EventsEnabled List of each collection event ID for which reporting is enabled.
31	SV	A[0..6]	MDLN Brief equipment identifier. Initial value is KI_APT.
32	SV	A	PPExecName Name of the process program currently in the equipment's Working Space.
33	SV	U4	PreviousCEID CEID of the last event that occurred.
34	SV	A	PreviousCommand Last command that was issued.
35	SV	U1	PreviousControlState Previous control state: 1 = OFF-LINE, EQUIPMENT OFF-LINE 2 = OFF-LINE, ATTEMPT ON-LINE 3 = OFF-LINE, HOST OFF-LINE 4 = ON-LINE, LOCAL 5 = ON-LINE, REMOTE
36	SV	U1	PreviousProcessState Previous Processing State. See ProcessState below for values.
37	SV	U1	ProcessState Current Processing State: 0 = Initializing 1 = Idle 2 = Moving to site 3 = Moving to subsite 4 = Loading wafer 5 = Testing 6 = Waiting for user input 7 = Unloading wafer 8 = Terminating test program 9 = Operator abort
38	SV	A[0..20]	SOFTREV Software revision.
39	SV	A[16] or A[12]	Time The host's view of the current date and time. The format is either YYYYMMDDhhmmsscc (TimeFormat = 1) or YYMMDDhhmmss (TimeFormat = 0).

VID	Class	Format	Name and description
40	DV	A	PPChangeName Name of the process program that was most recently changed. Valid on GemPPChangeEvent.
41	DV	U1	PPChangeStatus Status of the process program that was most recently changed: 1 = Created 2 = Changed (Currently not supported) 3 = Deleted
42	EC	U1 [Default: 3]	OfflineSubstate Specifies which offline substate the equipment will enter by default: 1 = OFF-LINE, EQUIPMENT OFF-LINE 2 = OFF-LINE, ATTEMPT ON-LINE 3 = OFF-LINE, HOST OFF-LINE
43	EC	U1 [Default: 3]	OnlineFailed Specifies which offline substate to transition to after equipment attempt to go On-line fails: 1 = OFF-LINE, EQUIPMENT OFF-LINE 3 = OFF-LINE, HOST OFF-LINE
44	EC	U1 [Default: 4]	OnlineSubstate Specifies the equipment control on-line substate: 4 = ON-LINE, LOCAL 5 = ON-LINE, REMOTE
46	EC	U4 [Default: 0]	MaxSpoolTransmit Specifies how many messages the equipment will send to the host in response to an S6F23 request. A value of zero implies that all messages in the spool will be sent.
48	SV	U4	SpoolCountActual Number of primary messages currently contained in the spool.
49	SV	U4	SpoolCountTotal Total number of messages sent to the spool since spooling became active.
50	SV	A[16]	SpoolFullTime Time when the spool fills up and old messages may start to be written over or new messages will be discarded. The format is YYYYMMDDhhmmsscc.
51	SV	U1	SpoolLoadSubstate Current spool state within the SPOOL LOAD super-state: 6 = NOT FULL 7 = FULL

VID	Class	Format	Name and description
52	SV	A[16]	SpoolStartTime Time when message spooling started. Format is YYYYMMDDhhmmsscc.
53	SV	U1	SpoolState Current Spool State within the POWER ON super-state: 1 = INACTIVE 2 = ACTIVE
54	SV	U1	SpoolUnloadSsubstate Current spool state within the SPOOL UNLOAD super-state: 3 = PURGE 4 = TRANSMIT 5 = NO OUTPUT
62	EC	Boolean [Default: FALSE]	OverWriteSpool Specifies whether to overwrite old messages when spool fills up: TRUE = Overwrite the oldest message. FALSE = Do now overwrite (discard new messages).
63	EC	U1 [Default: 0]	ConfigSpool Specifies whether to enable or disable spooling on equipment: 0 = DISABLED 1 = ENABLED
67	EC	U1 [Default: 1]	TimeFormat Specifies whether to use 12-byte or 16-byte format in reporting date and time: 0 = 12-byte format 1 = 16-byte format
69	EC	I4 [Default: 256]	TermReqSendMax Maximum length of Stream 10 text (in bytes) that the equipment can send to Host.
71	DV	A [0..20]	PreviousCommand Previously issued operator command. Valid on OperatorCommand event (CEID=152).
72	DV	U4	ECIDChange VID of Equipment Constant that is changed by operator. Valid on OperatorECChange event (CEID=153).
83	SV	U1	LinkState Current Communication state. Possible values are: 0 = Disabled 1 = Enabled/Not Communicating 2 = Communicating

VID	Class	Format	Name and description
84	SV	L	`VIDList` List of all defined VIDs. Each element of the list is a list containing the name, VID, and units of an equipment constant or status variable.
85	SV	L	`ALIDList` List of all defined alarms. Each element of the list is a list containing the alarm text string and ALID of an alarm.
86	SV	L	`CEIDList` List of all defined collection events. Each element of the list is a list containing the name and CEID of a collection event.
87	EC	U1 [Default: `0`]	`WBitS6F1` Specify whether to send S6F1 Trace reports with or without W-Bit set: `0` = W-Bit in S6F1 (trace) messages is determined by the setting of WBitS6 (VID=20) Equipment Constant. `1` = W-Bit in S6F1 (trace) messages will be set to "`1`" regardless of the WBitS6 (VID=20) setting. `2` = W-Bit in S6F1 (trace) messages will be set to "`0`" regardless of the WBitS6 (VID=20) setting.
8013	EC	U1 [Default: `0`]	`CfgSubstDelimiter` `CfgSubstDelimiter` allows optional control over how default substrate IDs are created in ConX300. Values are: `0` = Uses "`.`" (example: `CarrierID.01`); this is the default setting `1` = Uses "`_`" (example: `CarrierID_01`) Example: constant `CfgSubstDelimiter` = <`U1 0`> vid = user defined ID name = "`CfgSubstDelimiter`" units = "" Note that this constant applies to both substrates and reticles.
8103	EC	U1 [Default: `0`]	`ConfigReportLinkCEIDStatus` Normally, the event report is properly linked as expected when defining a Report, linking it to a CEID, enabling the CEID, and causing the CEID to be sent to the host. Then when the link is deleted, the CEID becomes disabled as well. Adding the optional equipment constant `ConfigReportLinkCEIDStatus` allows the user to choose how GWGEM works with Reports and CEIDs. This allows the user to choose if a CEID becomes disabled when a link is deleted.

VID	Class	Format	Name and description
8105	EC	U1 [Default: 0]	E50308Time This equipment constant enables the usage of the extended format specified in E5-0308 and allows GemClock to be affected by the changes in GemTimeFormat.
8110	EC	U1 [Default: 0]	DisableDSUploadEvents This variable determines if the GemSuccessfulUploadEvent or GemBadUploadEvent is sent after the final S13F6 is received. The default behavior is to send these events. Possible Values: ■ 0: Send the large process program upload events. This is the default setting. ■ 1: Do not send the large process program upload events.
8112	EC	U1 [Default: 2]	ConfigTimeSetReq The GemTimeSet() API, GemHostTimeReq() API, and the S2F31 SECS host message, request GWGEM to change the system time. This EC determines how GWGEM will carry out that request. It is an optional equipment constant. If it does not appear in the GCD file, then the GWGEM daemon will run as if it were set to zero (0), which is the way GWGEM has historically operated. It is only necessary to include this equipment constant definition if the desire is for GWGEM to operate in either of the other modes. ■ 0: Normally, this is the method GWGEM has used to set the system time. GWGEM calculates an offset from the system time and uses that offset to bias all reported times. In this method, the system time remains unchanged. ■ 1: GWGEM will change system time and update all internal times. This method may require that the GWGEM daemon process be running under increased system privileges. ■ 2: The extension handler function TimeSetReq is used to inform the extension process of the time set request value. The extension handler is responsible for changing the system time and returning a successful status on completion. When the GWGEM daemon received this successful return, it will update all its internal times accordingly. This method may require that the extension process be running under increased system privileges.
8114	EC	U1 [Default: 1]	GEME50707COMPLIANCE This equipment constant selects the SEMI standard to use when imposing value length limitations: E5 pre-0707 compliance, E5 0707, or later compliance. Beginning with E5 0707, larger dimensions are allowed. If a newer standard is needed (with longer values), GemE50707Compliance must be defined in the GCD file and its value must be 1. If it is not found in the GCD file or if its value is not 1, the older standard length limitations are used.

Process Variables

The following are the process-related variables and Equipment Constants supported by the equipment.

The standard KIGEMUAP user library provides an example for many of these variables along with their corresponding CEIDs. Some variables require custom user code implementation. Contact Keithley for assistance and further details.

VID	Class	Format	Name and description	Default
100	DV	A [0..50]	Lot ID Lot ID being tested. Valid on LotInfoAvailable event (CEID=162).	-
101	DV	A [0..255]	TestProgramName Test program name currently being used. Valid on PPSelected (CEID=151) and StartOfLot (CEID=146) events.	-
102	DV	A [0..50]	Product(Device)Type Valid on LotInfoAvailable event (CEID=162).	-
103	DV	A [0..20]	TesterID System/Tester ID. Valid on LotInfoAvailable event (CEID=162).	-
104	DV	A [0..20]	TestStartTime Time lot was started. Valid on StartOfLot event (CEID=146).	-
105	DV	A [0..20]	TestEndTime Time lot was completed. Valid on EndOfLot event (CEID=105).	-
106	DV	A [0..50]	ProcessType Process type (example: CMOS/MOS). Valid on LotInfoAvailable event (CEID=162).	-
107	DV	A [0..32]	WaferID Wafer ID being tested. Valid on StartWafer event (CEID=102).	-
108	DV	A [0..32]	SiteID Site ID being tested. Valid on StartOfSite event (CEID=183).	-
109	DV	U2	SlotID Slot ID for a given wafer. Valid on StartWafer event (CEID=102).	-

VID	Class	Format	Name and description	Default
110	DV	A [0..32]	SplitID Split ID for a given wafer. Valid on StartWafer event (CEID=102).	-
111	DV	I4	ProberErrorCode Prober alarm error number. Valid on Prober Alarm (ALID=170).	-
112	DV	I4	KeithleyErrorCode Keithley equipment alarm error number. Valid on all alarms and some error conditions.	-
113	DV	A [0..255]	KeithleyErrorText Keithley equipment alarm error text. Valid on all alarms and most error conditions, including ProberNError events (CEID=170 & 171).	-
114	DV	U2	CustomDataType Custom data type. Values are user-defined. 1 = integer 2 = unsigned integer 3 = floating point 4 = ascii 5 = binary 6 = boolean Valid on CustomDataAvailable event (CEID=106).	-
115	DV	B [0..64000]	BlockOfBinaryData Custom data block of binary data. Maximum length is 64,000 bytes. Valid on CustomDataAvailable event (CEID=106).	-
116	DV	F4 [0..16000]	TestResultArray1 First array of result data can be up to 16,000 elements. When applicable, valid on TestDataAvailable event (CEID=158).	-
117	DV	F4 [0..16000]	TestResultArray2 Second array of result data can be up to 16,000 elements. When applicable, valid on TestDataAvailable event (CEID=158).	-
118	DV	F4 [0..16000]	TestResultArray3 Third array of result data can be up to 16,000 elements. When applicable, valid on TestDataAvailable event (CEID=158).	-
119	DV	F4 [0..16000]	TestResultArray4 Fourth array of result data can be up to 16,000 elements. When applicable, valid on TestDataAvailable event (CEID=158).	-

VID	Class	Format	Name and description	Default
120	DV	F4 [0..16000]	TestResultArray5 Fifth array of result data can be up to 16,000 elements. When applicable, valid on TestDataAvailable event (CEID=158).	-
121	DV	A [0..128]	TestResultArray1Tag First test array name. When applicable, valid on TestDataAvailable event (CEID=158).	-
122	DV	A [0..128]	TestResultArray2Tag Second test array name. When applicable, valid on TestDataAvailable event (CEID=158).	-
123	DV	A [0..128]	TestResultArray3Tag Third test array name. When applicable, valid on TestDataAvailable event (CEID=158).	-
124	DV	A [0..128]	TestResultArray4Tag Fourth test array name. When applicable, valid on TestDataAvailable event (CEID=158).	-
125	DV	A [0..128]	TestResultArray5Tag Fifth test array name. When applicable, valid on TestDataAvailable event (CEID=158).	-
126	DV	F4	SiteRow Site row (Y). Valid on StartOfSite event (CEID=183).	-
127	DV	F4	SiteCol Site column (X). Valid on StartOfSite event (CEID=183).	-
128	DV	U2	ResultCount [Obsolete] Number of results per site.	-
129	EC	U1	EowConfig [Obsolete] Specifies whether to enable or disable the wafer Data Set generation on the equipment: 0 = DISABLED 1 = ENABLED	0
130	EC	U1	EolConfig [Obsolete] Specifies whether to enable or disable lot Data Set generation on the equipment: 0 = DISABLED 1 = ENABLED	0

VID	Class	Format	Name and description	Default
131	EC	I2	DSNumLots [Obsolete] The number of lots for which corresponding Data Sets are retained by the equipment. Range: 1-10	1
132	DV	A [0..255]	WaferPlanID Wafer plan ID. Valid on StartWafer events (CEID=102).	-
133	DV	A [0..50]	Cassette1ID Cassette #1 ID. Valid on Cassette1IdRead events (CEID=136).	-
134	DV	A [0..50]	Cassette2ID Cassette #2 ID. Valid on Cassette2IdRead events (CEID=137).	-
135	DV	A [0..30]	OperatorID Operator ID. Valid on LotInfoAvailable events (CEID=162).	-
136	DV	U2	TestResultCount Number of available test results. Valid on TestDataAvailable events (CEID=158).	0
137	DV	U2	ArrayResultCount Number of available array results. Valid on TestDataAvailable events (CEID=158).	0
138	SV	U1	ToolState SEMI E10 Tool state as set by operator. Possible values are: 0 = Productive 1 = Standby 2 = Engineering 3 = Scheduled downtime 4 = Unscheduled downtime 5 = Nonscheduled time	1
139	EC	U1	AutoClamp Automatically clamp a SMIF pod upon arrival. 0 = Disable 1 = Enable	0
140	EC	U1	AutoUnclamp Automatically unclamp a SMIF pod upon unloading. 0 = Disable 1 = Enable	0

VID	Class	Format	Name and description	Default
141	DV	U1 [0..104]	Cassette1SlotMap Port #1 cassette slot map. Valid on Cassette1Mapped events (CEID=164). Possible slot codes are: 1 = Unmapped 2 = In-process 3 = Empty 4 = Unprobed 5 = Probed 6 = Problem 7 = Unscheduled	-
142	DV	U1 [0..104]	Cassette2SlotMap Port #2 cassette slot map. Valid on Cassette2Mapped events (CEID=165). Uses the same slot codes as Cassette1SlotMap.	-
143	EC	U1	DisableS10Acq [Reserved for future release] Determine the setting of the Acknowledge button on the terminal display (S10) message window: 0 = Enable 1 = Disable	0
144	SV	U1	Port1State Port #1 State. Possible values are: 0 = Empty 1 = Loading 2 = Loaded 3 = Error 4 = Clamped 5 = Unclamped 6 = Unloaded 7 = Occupied 8 = Docked 9 = Undocked	0
145	SV	U1	Port2State Port #2 State. Uses the same Port State codes as Port1State above.	0
146	SV	U1	Lot1State Port #1 Lot State. Possible values are: 0 = Idle 1 = Processing 2 = Paused 3 = Complete 4 = Error	0
147	SV	U1	Lot2State Port #2 Lot State. Uses the same Lot State codes as Lot1State above.	0

VID	Class	Format	Name and description	Default
148	DV	A [0..255]	TestProgramArgs KTXE command-line arguments. Valid on StartOfLot events (CEID=146).	-
149	DV	A [0..32]	SubsiteID Subsite ID being tested. Valid on StartOfSubsite events (CEID=184).	-
150	DV	F4	SubsiteX Subsite X coordinate. Valid on StartOfSubsite events (CEID=184).	-
151	DV	F4	SubsiteY Subsite Y coordinate. Valid on StartOfSubsite events (CEID=184).	-
152	DV	A [0..255]	TestMacroID Test macro (KTM) ID. Valid on StartOfTest events (CEID=182).	-
153	DV	A [0..80]	WaferDescriptionID Wafer Description (WDF) ID. Valid on StartWafer events (CEID=102).	-
154	DV	A [0..80]	LimitFileID Limit File (KLF) ID. Valid on StartWafer events (CEID=102).	-
155	DV	A [0..255]	ProductFileID Uploaded prober product file ID. Valid on LotInfoAvailable events (CEID=162).	-
156	SV	U1	RecipeMode GemCP recipe mode. Possible values are: 0 = KTP_CPF_Mode 1 = KTP_KRF_Mode	0
157	DV	A [0..31]	ProbeCardModel Probe card model. Valid on ProbeCardDataAvailable events (CEID=186).	-
158	DV	A [0..31]	ProbeCardType Probe card type. Valid on ProbeCardDataAvailable events (CEID=186).	-
159	DV	A [0..31]	ProbeCardSerial Probe card serial number. Valid on ProbeCardDataAvailable events (CEID=186).	-

VID	Class	Format	Name and description	Default
160	DV	A [0..31]	ProbeCardComment Probe card user comment. Valid on ProbeCardDataAvailable events (CEID=186).	-
161	DV	I4	ProbeCardCycle Probe card cycle counter value. Valid on ProbeCardDataAvailable events (CEID=186).	-
162	DV	I4	ProbeCardLife Probe card lifetime counter value. Valid on ProbeCardDataAvailable events (CEID=186).	-
163	DV	A [0..255]	ProberFileID Currently loaded prober file ID. Valid on ProberFileIDAvailable events (CEID=188).	-
164	SV	U1	ActivePortNumber Currently running port number. Possible values are: 0 = Undefined 1 = Port 1 2 = Port 2	0
165	EC	U1	StopUnit When to stop a test. Possible values are: 0 = End of site 1 = End of wafer	1
166	DV	F4	ChuckCurrentTemp Chuck/stage current temperature in degrees Celsius. Valid on ChuckTempReadOK events (CEID=3016)	-
167	DV	F4	ChuckSettingTemp Chuck/stage setting temperature in degrees Celsius. Valid on ChuckTempReadOK events (CEID=3016)	-
168	EC	A [0..32]	EquipmentID User-configurable Equipment ID.	"KEITHLEY APT"
169	DV	I4	WaferTouchDownCount Total number of touch downs within a wafer. Valid on EndOfWafer (CEID=104) events.	-
170	EC	A [0..32]	ProberID User-configurable Prober ID.	"Prober ID"
171	DV	A [0..256]	TextUserData1 User-configurable text variable #1.	-
172	DV	A [0..256]	TextUserData2 User-configurable text variable #2.	-

VID	Class	Format	Name and description	Default
173	DV	A [0..256]	TextUserData3 User-configurable text variable #3.	-
174	DV	A [0..256]	TextUserData4 User-configurable text variable #4.	-
175	DV	A [0..256]	TextUserData5 User-configurable text variable #5.	-
176	DV	A [0..256]	TextUserData6 User-configurable text variable #6.	-
177	DV	A [0..256]	TextUserData7 User-configurable text variable #7.	-
178	DV	A [0..256]	TextUserData8 User-configurable text variable #8.	-
179	DV	A [0..256]	TextUserData9 User-configurable text variable #9.	-
180	DV	A [0..256]	TextUserData10 User-configurable text variable #10.	-
181	DV	I4	IntegerUserData1 User-configurable integer variable #1.	-
182	DV	I4	IntegerUserData2 User-configurable integer variable #2.	-
183	DV	I4	IntegerUserData3 User-configurable integer variable #3.	-
184	DV	I4	IntegerUserData4 User-configurable integer variable #4.	-
185	DV	I4	IntegerUserData5 User-configurable integer variable #5.	-
186	DV	I4	IntegerUserData6 User-configurable integer variable #6.	-
187	DV	I4	IntegerUserData7 User-configurable integer variable #7.	-
188	DV	I4	IntegerUserData8 User-configurable integer variable #8.	-

VID	Class	Format	Name and description	Default
189	DV	I4	`IntegerUserData9` User-configurable integer variable #9.	-
190	DV	I4	`IntegerUserData10` User-configurable integer variable #10.	-
191	DV	F4	`FloatUserData1` User-configurable float variable #1.	-
192	DV	F4	`FloatUserData2` User-configurable float variable #2.	-
193	DV	F4	`FloatUserData3` User-configurable float variable #3.	-
194	DV	F4	`FloatUserData4` User-configurable float variable #4.	-
195	DV	F4	`FloatUserData5` User-configurable float variable #5.	-
196	DV	F4	`FloatUserData6` User-configurable float variable #6.	-
197	DV	F4	`FloatUserData7` User-configurable float variable #7.	-
198	DV	F4	`FloatUserData8` User-configurable float variable #8.	-
199	DV	F4	`FloatUserData9` User-configurable float variable #9.	-
200	DV	F4	`FloatUserData10` User-configurable float variable #10.	-
201	DV	L	`ListUserData1` User-configurable list variable #1.	-
202	DV	L	`ListUserData2` User-configurable list variable #2.	-
203	DV	L	`ListUserData3` User-configurable list variable #3.	-

VID	Class	Format	Name and description	Default
204	DV	L	`ListUserData4` User-configurable list variable #4.	-
205	DV	L	`ListUserData5` User-configurable list variable #5.	-
206	DV	L	`ListUserData6` User-configurable list variable #6.	-
207	DV	L	`ListUserData7` User-configurable list variable #7.	-
208	DV	L	`ListUserData8` User-configurable list variable #8.	-
209	DV	L	`ListUserData9` User-configurable list variable #9.	-
210	DV	L	`ListUserData10` User-configurable list variable #10.	-
211	DV	A `[0..31]`	`PrevProbeCardModel` Previous probe card model. Valid on `ProbeCardRemoved` events (CEID=189).	-
212	DV	A `[0..31]`	`PrevProbeCardType` Previous probe card type. Valid on `ProbeCardRemoved` events (CEID=189).	-
213	DV	A `[0..31]`	`PrevProbeCardSerial` Previous probe card serial number. Valid on `ProbeCardRemoved` events (CEID=189).	-
214	DV	A `[0..31]`	`PrevProbeCardComment` Previous probe card user comment. Valid on `ProbeCardRemoved` events (CEID=189).	-
215	DV	I4	`PrevProbeCardCycle` Previous probe card cycle counter value. Valid on `ProbeCardRemoved` events (CEID=189).	-
216	DV	I4	`PrevProbeCardLife` Previous probe card lifetime counter value. Valid on `ProbeCardRemoved` events (CEID=189).	-
1001	DV	F4	`TestResult1` First test result.	-
1002	DV	F4	`TestResult2` Second test result.	-

VID	Class	Format	Name and description	Default
1003	DV	F4	`TestResult3` Third test result.	-
			. . .	-
			Note: 450 Test Result variables are available. When applicable, these variables are valid on `TestDataAvailable` events (CEID=158).	-
			. . .	-
1450	DV	F4	`TestResult450` 450th test result.	-
2001	DV	A `[0..128]`	`TestResult1Tag` Test result #1 tag.	-
2002	DV	A `[0..128]`	`TestResult2Tag` Test result #2 tag.	-
2003	DV	A `[0..128]`	`TestResult3Tag` Test result #3 tag.	-
			. . .	-
			Note: 450 Test Result Tags are available. When applicable, these variables are valid on `TestDataAvailable` events (CEID=158).	-
			. . .	-

VID	Class	Format	Name and description	Default
2450	DV	A [0..128]	TestResult450Tag Test result #450 tag.	-
5500	SV	U1	PrbHsmsCommStatus Status of PRBHOST to prober HSMS communications. Possible values are: 0 = Disabled 1 = Enabled	0
5504	SV	U1	PrbControlState Prober Control State. Possible values are: 1 = Offline 4 = Online – Local 5 = Online – Remote	1
5505	DV	I4	PrbAlarmID Prober Alarm ID. Valid on PrbAlarmEventOff (CEID=5550) and PrbAlarmEventOn (CEID=5551).	-
5506	DV	A [0..255]	PrbAlarmText Prober Alarm Text. Valid on PrbAlarmEventOff (CEID=5550) and PrbAlarmEventOn (CEID=5551).	-
5507	SV	A [0..255]	ProjectName Currently selected project name. The ProjectNameChanged event (CEID=5507) is sent out whenever the value of this variable changes.	-
5508	SV	A [0..255]	RfiFile Currently selected RFI file (.rfi). The RfiFileChanged event (CEID=5508) is sent out whenever the value of this variable changes.	-
5509	SV	A [0..80]	ProcessingPRJobId Name (ID) of Process Job (PJ) that is currently in the Processing State. This variable is updated whenever a new PJ enters the Processing State and cleared whenever KTXECWP exits.	-
5510	SV	A [0..80]	ExecutingCtrlJobID Name (ID) of Control Job (CJ) that is currently in the Executing State. This variable is updated whenever a new CJ enters the Executing State and cleared whenever KTXECWP exits.	-

Section 5

Alarms

In this section:

Introduction

This section describes the Carrier Management and GEM alarms implemented in this equipment.

Alarm category

The equipment uses the lower 7-bits of the alarm code data item (ALCD) to categorize the alarms according to the SEMI E5-0298 standard. The following alarm category codes are used:

Alarm category code	Alarm type	Alarm description
1	Personal safety	The condition may be dangerous to people.
2	Equipment safety	The condition may harm equipment.
3	Parameter control warning	The condition may harm product.
4	Parameter control error	The condition may indicate an equipment malfunction.
5	Irrecoverable error	An intervention is required before normal use of equipment can resume.
6	Equipment status warning	An unexpected condition has occurred, but operation can continue.
7	Attention flags	A signal that a particular step has been reached.
8	Data integrity	A condition which may cause loss of data has occurred.

Carrier Management Alarms

The following table describes the GEM Alarms implemented in this equipment to support the SEMI E87 Carrier Management standard.

ALID	ALCD	On CEID	Off CEID	Name, ALTX, and description
5007	7	5007	5008	`AlarmCarrierIDVerification` An error has occurred during Carrier ID Verification. When an error occurs, the alarm is generated and then immediately ends. The alarm Events are `AlarmCarrierIDVerificationEventOn` and `AlarmCarrierIDVerificationEventOff`. When this alarm occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5009	7	5009	5010	`AlarmSlotMapRead` An equipment attempt to read the Slot Map has failed. When an error occurs, the alarm is generated and then immediately ends. The alarm Events are `AlarmSlotMapReadEventOn` and `AlarmSlotMapReadEventOff`. When this alarm occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.
5011	7	5011	5012	`AlarmSlotMapVerification` An error occurred during Slot Map Verification. When an error occurs, the alarm is generated and then immediately ends. The alarm Events are `AlarmSlotMapVerificationEventOn` and `AlarmSlotMapVerificationEventOff`. When this alarm occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.

ALID	ALCD	On CEID	Off CEID	Name, ALTX, and description
5023	7	5023	5024	AlarmDuplicateCarrierID The equipment has detected loading of a carrier with the same Carrier ID as another carrier already in the equipment. The equipment refuses the new carrier and prevents processing of the old carrier, if possible. This alarm is generated when the error is detected and ends when the error conditions are corrected. The alarm Events are AlarmDuplicateCarrierIDEventOn and AlarmDuplicateCarrierIDEventOff. When this alarm occurs, this equipment saves the related Carrier and Load Port data to the corresponding current Data Variables.

GEM alarms

The equipment supports GEM alarm reporting and management capability as specified in the SEMI E30 standard.

ALID	ALCD	On CEID	Off CEID	Name, ALTX, and description
121	7	107	108	Configuration Error Test Program could not start due to configuration problem.
122	7	109	110	Hardware Error Test Program could not start due to hardware problem.
123	7	111	112	Software Error Test Program could not start due to software problem.
124	7	113	114	Data Overflow More than 450 test results or more than 5 arrays of data.
125	7	117	118	Data Set Generation Error File I/O, memory allocation error during Data Set creation.
170	7	115	116	Prober Alarm Error detected in GPIB communications with the prober.

Section 6

Error codes

In this section:

Error codes

The following table contains descriptions of error codes returned by ConX300 API functions.

Error #	Error Code String	Description
0	ERR_OK	No error
1 to 127	ERR_RES001 through ERR_RES127	Reserved for future use [001..127]
128	ERR_UDN	Unrecognized Device ID
129	ERR_USN	Unrecognized Stream Type
130	ERR_UFN	Unrecognized Function Type
131	ERR_IDN	Illegal Data
132	ERR_NULL	Required pointer has NULL value
133	ERR_NO_LEN	Must have 1...3 length bytes
134	ERR_SECS_LOC	Near Item 3
135	ERR_SECS	Invalid SECS Structure
136	ERR_SECS_TYPE	Invalid data item type
137	ERR_SECS_FIT	Data items do not fit exactly in data length
138	ERR_NAME_ASCII	Name strings must be ASCII
139	ERR_NAME_LONG	Name string too long
140	ERR_NAME	Invalid attribute name
141	ERR_NAME_UNK	Unknown attribute name
142	ERR_NAME_NOT	Known valid but incorrect attribute name
143	ERR_INDEX	Bad index
144	ERR_UNSIGNED	Invalid unsigned number
145	ERR_SIGNED	Invalid signed number
146	ERR_OBJID	Invalid object ID
147	ERR_OBJTYPE	Invalid object type
148	ERR_ASCII_ATTRIB	Invalid ASCII attribute value
149	ERR_LIST	Expected List or List bad length
150	ERR_LIST0	Expected List with 0 elements
151	ERR_LIST1	Expected List with 1 element
152	ERR_LIST2	Expected List with 2 elements
153	ERR_LIST3	Expected List with 3 elements

Error #	Error Code String	Description
154	ERR_LIST4	Expected List with 4 elements
155	ERR_LIST5	Expected List with 5 elements
156	ERR_LIST6	Expected List with 6 elements
157	ERR_LIST7	Expected List with 7 elements
158	ERR_CAR_ACTION	Invalid CARRIERACTION
159	ERR_PORT_ACTION	Invalid PORTACTION
160	ERR_CAR_ID	Invalid CARRIERID
161	ERR_SLOT_NUM	Invalid Carrier Slot Number
162	ERR_PORT_ACCESS_MODE	Invalid PORTACCESS
163	ERR_PORT_NUM	Invalid PORTID
164	ERR_PROC_CMD_NAME	Invalid Process Command Name
165	ERR_PROC_CMD_PARAM_NAME	Invalid Process Job Command Parameter Name
166	ERR_PROC_JOB_ID	Invalid Process Job
167	ERR_ATTR_PRIVATE	Host access is read-only
168	ERR_CAPACITY	Invalid CAPACITY
169	ERR_SUBSTRATE	Invalid SUBSTRATEID
170	ERR_SUBSTRATE_NUM	Substrate Count is invalid
171	ERR_SUBSTRATE_NOT_DONE	Substrate not done
172	ERR_SLOTMAP	SlotMap attribute is invalid
173	ERR_USAGE	Usage attribute is invalid
174	ERR_LOCATIONID	LocationID Attribute is invalid
175	ERR_NEED_CID	CARRIERID is required
176	ERR_NEED_PTN	PORTID is required
177	ERR_NEED_CID_PTN	CARRIERID and PORTID are both required
178	ERR_NEED_CID_O_PTN	CARRIERID or PORTID is required
179	ERR_OBJID_NOT_HERE	Specified Object Not Found
180	ERR_NIL_OBJID	Specified ObjectID was zero-length
181	ERR_ATTR_ID	Invalid ATTR ObjID
182	ERR_RO	Read-Only Attribute
183	ERR_ATTR_INT	Invalid ATTR Integer
184	ERR_QUAL	Invalid Qualifier
185	ERR_QUAL_LIST	Qualifier must be a List
186	ERR_QUAL_LIST_LEN	Qualifier List Length not 2 or 3
187	ERR_QUAL_VAL_LIST	Qualifier value may not be a List
188	ERR_ATTR_COMPARE_MISMATCH	Qualifier Value and Attribute Value have different data types
189	ERR_NO_MEMORY	Need more memory to process message
190	ERR_ATTR_RELN	Qualifier Compare Operator Invalid
191	ERR_ATTR_VAL	Attribute value missing or invalid
192	ERR_DATA_TYPE_INVALID	Qualifier Data Type or Operator Mismatch
193	ERR_MATL_ID	Substrate Identifier Invalid

Error #	Error Code String	Description
194	ERR_MATL_TYPE	Process Job Material Type Invalid
195	ERR_AUTO_START	Process Job Auto Start Invalid
196	ERR_RECIPE_METH	Process Job Recipe Method Invalid
197	ERR_PRJOB_STATE	Process Job State Invalid
198	ERR_PRJOB_EDGE	Process Job Edge Invalid
199	ERR_CTRLJOB_EDGE	Control Job Edge Invalid
200	ERR_PRJ_EVENT	Process Job Event Invalid
201	ERR_DUP_WAFER	Duplicate Wafer
202	ERR_DUP_PROCJOB	Duplicate Process Job
203	ERR_DUP_CTRLJOB	Duplicate Control Job
204	ERR_ECS_PROCJOB_REJECT	Process Job rejected by ECS
205	ERR_ECS_CTRLJOB_REJECT	Control Job rejected by ECS
206	ERR_ECS_REJECT	Command rejected by ECS
207	ERR_NO_PROCJOB	Missing Process Job
208	ERR_NO_CTRLJOB	Missing Control Job
209	ERR_CTRLJOB_CMD	Control Job Command Missing or Invalid
210	ERR_BAD_PROCESS_ORDER_MGMT	`ProcessOrderMgmt` must be in U1 format with a value of `1`, `2`, or `3`
211	ERR_UNDEFINED_ATTRIBUTE	At least one attribute needed by the object is undefined
212	ERR_BAD_MTRL_LIST	Material List format does not fit Substrates or Carriers
213	GW300_ERROR_OUT_OF_MEMORY	Cannot allocate memory
214	GW300_ERROR_ALREADY_EXIST	An attempt to reallocate existing object
215	GW300_ERROR_MAP_PROBLEM	Object mapping problem
216	GW300_ERROR_NOT_FOUND	Cannot find object
217	GW300_ERROR_ALREADY_INITIALIZED	Attempt to re-initialize an object
218	GW300_ERROR_NEVER_INITIALIZED	Attempt to use an un-initialized object
219	GW300_ERROR_CANNOT_INITIALIZE	Initialization problem
220	GW300_ERROR_CANNOT_CONSTRUCT_OBJECT	Cannot construct object
221	GW300_ERROR_CANNOT_SPAWN_THREAD	Cannot spawn a new thread
222	GW300_ERROR_CANNOT_CREATE_VIDMAP	Cannot create an internal VID map
223	GW300_ERROR_CANNOT_CALL_APP	Cannot make a Note call to the application
224	GW300_ERROR_PORT_CANNOT_BIND	Port cannot bind
225	GW300_ERROR_PORT_NOT_COMMITTED	Port is not committed to load or unload
226	GW300_ERROR_PORT_NOT_READY	The port is not ready Cannot comply
227	GW300_ERROR_CARRIER_NOT_READY	The Carrier is not ready Cannot comply
228	GW300_ERROR_CARRIER_CANNOT_BIND	Carrier cannot Bind
229	GW300_ERROR_CARRIER_CANNOT_MOVE	Carrier cannot Move
230	GW300_ERROR_CARRIER_CANNOT_STOP	Carrier cannot Stop

Error #	Error Code String	Description
231	GW300_ERROR_SLOT_MAP_VERIFY_FAILED	Slot Map Verification failed
232	GW300_ERROR_CANNOT_CHANGE_ACCESS	Cannot change Access State
233	GW300_ERROR_CANNOT_PROCEED_WITH_CARRIER	Cannot proceed with Carrier
234	GW300_ERROR_CANNOT_COPY_SLOT_MAP	Cannot copy Slot Map
235	GW300_ERROR_CANNOT_CANCEL_CARRIER	Cannot cancel Carrier
236	GW300_ERROR_CANNOT_CANCEL_BIND	Cannot cancel Bind
237	GW300_ERROR_LOCATION_CANNOT_ACCEPT	Cannot Accept/Eject a Carrier
238	GW300_ERROR_LOCATION_PORT_INCONSISTENCY	Port and Location status is inconsistent
239	GW300_ERROR_FIMS_NOT_EMPTY	FIMS Location is not empty as expected
240	GW300_ERROR_NOT_FIXED_BUFFER	An attempt to use a non-fixed-buffer Load Port
241	GW300_ERROR_LOCATION_NOT_READY	Location is not ready for this operation
242	GW300_ERROR_INVALID_HANDLE	Invalid pointer or handle to an object
243	GW300_ERROR_INSUFFICIENT_INFORMATION	Insufficient information
244	GW300_ERROR_CANNOT_OPEN_DOOR	Cannot open door
245	GW300_ERROR_CANNOT_CLOSE_DOOR	Cannot close door
246	GW300_ERROR_CANNOT_REMOVE_SUBSTRATE	Cannot remove substrate
247	GW300_ERROR_CANNOT_INSERT_SUBSTRATE	Cannot insert substrate
248	GW300_ERROR_SUBSTRATE_CANNOT_MOVE	Cannot start substrate move
249	GW300_ERROR_SUBSTRATE_CANNOT_STOP	Cannot stop substrate move
250	GW300_ERROR_ILLEGAL_SUBSTRATE_STATE	Illegal substrate state
251	GW300_ERROR_CANNOT_SEND_EVENT	Cannot send Event
252	GW300_ERROR_CANNOT_RELEASE_CARRIER	Cannot release Carrier
253	GW300_PULSE_INVALID	GEM_PULSE is not valid in this context
254	API300_GWASEM_TIMEOUT	Timeout on X0G0 mutex
255	API300_GWASEM_REL_TYPE	Cannot release a non-resource semaphore
256	API300_GWASEM_SYSTEM	OS-dependent error
257	API300_GWIPC_ADDCQ	AddClientQueue() failed
258	API300_GWIPC_INITCQ	InitializeCallQueue() failed
259	API300_GWIPC_NEWMG	GetNewClientMessageGroupId() failed
260	API300_GWIPC_ADDMG	AddMessageGroup() failed
261	API300_GWIPC_INITMG	InitMessageGroup() failed
262	API300_GWIPC_INITRB	InitializeRequest Block() failed
263	API300_GWIPC_NEWRQ	NewRequest() failed
264	API300_GWIPC_TYPE	Wrong parameter type
265	API300_GWIPC_COUNT	Wrong parameter count
266	API300_GWIPC_MISSING	Missing parameter
267	API300_GWIPC_XMIT	Transmission error
268	API300_GWIPC_INDEX	Invalid index
269	API300_GWIPC_INVRESP	Invalid response

Error #	Error Code String	Description
270	GW300_ERROR_CANNOT_INFLATE_SLOTMAP	Cannot inflate Slot Map
271	API300_ATTR_WARNING	Buffer too small
272	ERR_CANNOT_CANCEL_PROJOB	Process Job attached to a Control Job cannot be canceled
273	ERR_CANNOT_SET_ATTR	Cannot set attribute; Attribute does not exist or is not allowed to be set
274	ERR_OSS_CTRLJOB_ACTIVE	Control Job active, so OSS may not change attributes
275	ERR_NOT_SELECTED	Job not Selected
276	ERR_CANNOT_RECREATE	Cannot Recreate Carrier
277	API300_GWIPC_NOTRUNNING	Server Not Running
278	API300_LISP-ERROR	LISP initialization failed
279	GW300_ERROR_PRJOB_ALREADY_ASSOC	Process Job Already Associated with Material
280	GW300_ERROR_WRONG_RANGE	Wrong Parameter Range
281	ERR_PRJOB_MAXIMUM	PrJobs of Maximum Limit
282	GW300_ERROR_ILLEGAL_EPT_STATE	Invalid EPT state
283	GW300_ERROR_ILLEGAL_EPT_TASK	Invalid EPT task
284	GW300_ERROR_ILLEGAL_EPT_BLOCKED_REASON	Invalid Blocked Reason Code
285	ERR_NOT_LIST	SECS type is not a list
286	ERR_LIST_LEN	Expected List of Different Length
287	ERR_DUP_PARTITION	Duplicate Partitions
288	ERR_LOC_TYPE	Wrong Location Type
289	ERR_PRJOB_DONE	Process Job Cannot Transition to Done
290	ERR_PRJOB_COMPLETE	Process Job Not In Valid State to Complete
291	ERR_PRJOB_PAUSE	Process Job Not In Valid State for Pause
292	ERR_PRJOB_RESUME	Process Job Not In Valid State for Resume
293	ERR_PRJOB_SETUP	Process Job Not In Valid State for Setup
294	ERR_PRJOB_STOP	Process Job Not In Valid State for Stop
295	ERR_PRJOB_ABORT	Process Job Not In Valid State for Abort
296	ERR_PRJOB_CANCEL	Process Job Not In Valid State for Cancel
297	GW300_ERROR_CANNOT_RESERVE_AT_PORT	-
298	GW300_ERROR_CANNOT_CANCEL_RESERVE_AT_PORT	-
299	ERR_DUP_SUBSTRATE	Duplicate Substrate
300	ERR_ECS_SUBSTRATE_REJECT	Substrate Rejected by ECS

Section 7

SECS messages

In this section:

Introduction

This section describes the SECS messages implemented in this equipment to support the following standards:

- SEMI E39 Object Services
- SEMI E87 Carrier Management
- SEMI E90 Substrate Management
- SEMI E40 Process Management
- SEMI E94 Control Job Management
- SEMI E116 Equipment Performance Tracking
- SEMI E30 GEM

Message Summary

Host to Equipment Transactions

Primary	Reply	Description	Supported by ConX300
S3F15	S3F16	Inquire/Grant	Yes
S3F17	S3F16	Carrier Action Request Carrier Action Request Example #1	Yes
S3F17	S3F18	Bind CancelBind CancelCarrier CancelCarrierAtPort CancelCarrierNotification	Yes
S3F17	S3F18	CancelCarrierOut CarrierIn	No*
S3F17	S3F18	CarrierNotification	Yes
S3F17	S3F18	CarrierOut	No*
S3F17	S3F18	CarrierReCreate CarrierRelease	Yes
S3F17	S3F18	ProceedWithCarrier Proceed With Carrier Type #1 Proceed With Carrier Type #2 Proceed With Carrier Type #3 Proceed With Carrier Type #4 Proceed With Carrier Type #5 Proceed With Carrier Type #6	Yes
S3F19	S3F20	Cancel All Carrier Out	No*
S3F23	S3F24	Change Access for Port List	Yes
S3F25	S3F26	CancelReservationAtPort ChangeAccess ChangeServiceStatus In Service InService Out Of Service OutOfService ReserveAtPort	Yes
S3F27	S3F28	Change Access	Yes
S3F29	S3F30	Carrier Tag Read Request	Yes
S3F31	S3F32	Carrier Tag Write Data Request	Yes
S14F1	S14F2	Get Attributes GetAttr Example #1 GetAttr Example #2 GetAttr Example #3 for EPT GetAttr Example #4 for EPT	Yes
S14F3	S14F4	Set Attribute	Yes
S14F5	S14F6	GetType Request	Yes
S14F7	S14F8	Get Attribute Names	Yes
S14F9	S14F10	Create Object Control Job Substrate	Yes

Primary	Reply	Description	Supported by ConX300
S14F11	S14F12	Delete Object	Yes
S14F19	S14F20	Generic Service Request/Ack	Yes
S16F1	S16F2	Multi-Block Inquire/Grant	Yes
S16F5	S16F6	Process Job Command Process Job Command (Abort) Process Job Command (Cancel) Process Job Command (Pause) Process Job Command (Resume) Process Job Command (Stop) Process Job Command (Acknowledge)	Yes
S16F11	S16F12	Enhanced Process Job Create	Yes
S16F13	S16F14	Process Job Duplicate Create	Yes
S16F15	S16F16	Process Job Multiple Create	Yes
S16F17	S16F18	Process Job Dequeue	Yes
S16F19	S16F20	Get Process Job List	Yes
S16F21	S16F22	Get Process Job Space	Yes
S16F23	S16F24	Set Process Job Recipe Variable	No**
S16F25	S16F26	Set Process Job Start Method	No
S16F27	S16F28	Control Job Command Request Control Job Command (CjStart) Control Job Command (CjPause) Control Job Command (CjResume) Control Job Command (CjCancel) Control Job Command (CjDeselect) Control Job Command (CjStop) Control Job Command (CjAbort) Control Job Command (CjHOQ)	Yes
S16F29	S16F30	PrJobSetMaterialOrder	No**

*These messages apply only to internal buffer equipment and are not used for fixed buffer equipment.

**This equipment does not support this message. The host must set the desired attribute values when it creates the process job.

Equipment to Host Transactions

Primary	Reply	Description	Supported by ConX300
S16F7	S16F8	Process Job Alert	No*
S16F9	S16F10	Process Job Event	No*

*This equipment supports Process Job Alert and Process Job Event using E30 style events.

S3F15 Inquire

```
S3F15 W            /* Materials Multi-Block Inquire (MMBI) S,H->E */
   <L [2]
      <U4 DATAID>
      <U4 DATALENGTH>
   > .
```

The host may send this message prior to sending a multi-block message. However, this equipment does not require it.

S3F16 Grant

```
S3F16            /* Materials Multi-Block Grant (MMBG) S,H<-E */
   <B [1] GRANT> .
```

`GRANT = 0x00` indicates that the equipment accepts the Inquire. Any other value indicates that the equipment has refused the Inquire.

S3F17 Carrier Action Request

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A CARRIERACTION>
      <A CARRIERSPEC>
      <U1 PTN>
      <L [NumberOfAttributes]
         <L [2]
            <ATTRID>
            <ATTRDATA>
         >
         ...       /* More Attributes */
      >
   >.
```

The host requests an action related to a specific carrier.

This message may be preceded by the `S3F15/S3F16 Inquire Grant`, but this equipment does not require it, even if `S3F17` is multi-block.

`DATAID` is ignored by this equipment.

CARRIERACTION specifies the action to be performed and must be one of the following values, which may be specified in any combination of upper and lower case.

- "Bind"
- "CancelBind"
- "CancelCarrier"
- "CancelCarrierAtPort"
- "CancelCarrierNotification"
- "CarrierNotification"
- "CarrierReCreate"
- "CarrierRelease"
- "ProceedWithCarrier"

CARRIERSPEC specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters.

PTN specifies the Port Number for services that require it. For services that do not specify a Port Number, this field should be zero-length.

ATTRID specifies the attribute identifier. This can be specified either as an Attribute Name (ASCII) or an Attribute Number (Ux). The attribute ID must be one of the allowed attributes for the service requested by CARRIERACTION.

ATTRDATA (Attribute Data) specifies the value for the attribute specified in ATTRID.

S3F17 Carrier Action Request - Example

Your message may vary slightly depending on the carrier configuration.

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 0>                                  /* DataID */
      <A "ProceedWithCarrier">                /* Carrier action */
      <A "CARRIERS123">                       /* CarrierID */
      <U1 1>                                  /* PortLocationID */
      <L
         <L [2]                               /* Host Set */
            <A "Capacity">                    /* Number of slots in Carrier */
            <U1 25>
         >
         <L [2]
            <A "ContentMap">
            <L
            <L [2]
               <A "Lot1">
               <A "Substrate1">
            >
            <L [2]
               <A "Lot1">
               <A "Substrate2">
            >
            <L>                               /* Empty Slot */
            <L [2]
            <A "Lot1">
            <A "Substrate3">
         >
      >
   >
   <L [2]
      <A "SlotMap">                           /* Ordered List of Slot Status, Host
   set*/
      <L                                      /* Up to Capacity*/
         <U1 3>                               /* Normal Wafer */
         <U1 3>                               /* Normal Wafer */
         <U1 1>                               /* EMPTY */
         <U1 3>                               /* Normal Wafer */
      >
   >
   <L [2]
      <A "SubstrateCount">                    /* Host Set */
      <U1 3> /                                /* Number of wafers in Carrier*/
   >
   <L [2]                        /* Type of Substrates contained in Carrier*/
      <A "Usage">                             /* Host Set */
      <A "PRODUCT">                           /* "DUMMY", "PRODUCT", "FILLER", ...*/
   >
  >
> .
```

S3F17 Bind

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A "Bind">                /*CARRIERACTION */
      <A CARRIERSPEC>
      <U1 PTN>
      <L [NumberOfAttributes]
         <L [2]
            <ATTRID>
            <ATTRDATA>
         >
         ...                    /* More Attributes */
      >
   > .
```

The host predicts that the specified CarrierID will arrive at the specified port. Optionally, the host may provide attributes of the predicted carrier.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it, even if `S3F17` is multi-block.

`DATAID` is ignored by this equipment.

`CARRIERACTION` ("`Bind`") may be specified in any combination of upper- and lowercase letters.

The host must specify both `CARRIERSPEC` and `PTN`, or this equipment will reject the message.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters. This is required. This equipment will reject the message if it is zero-length.

`PTN` specifies the Port Number. This is required. This equipment will reject the message if zero-length.

`ATTRID` (Attribute ID) may be specified either as an Attribute Name (ASCII) or an Attribute Number (Ux).

`ATTRDATA` (Attribute Data) specifies the value for the attribute specified in `ATTRID`.

The `Bind` may optionally contain any of the following Carrier Object Attributes:

- `Capacity`
- `ContentMap`
- `SlotMap`
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if CfgWIDAngle (on page 4-5) is set to `0x01`)

The Bind may not contain any other carrier object attributes.

S3F17 CancelBind

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A "CancelBind">          /*CARRIERACTION */
      <A CARRIERSPEC>
      <U1>                      /* PTN */
      <L>                       /* Attributes */
   > .
```

The host destroys the prediction of a carrier arrival previously created by a Bind. It also destroys the Reservation of the Port to which the carrier is bound.

This message may be preceded by S3F15/S3F16 Inquire/Grant, but this equipment does not require it, even if S3F17 is multi-block.

DATAID is ignored by this equipment.

CARRIERACTION ("CancelBind") may be specified in any combination of upper- and lowercase letters.

The host must specify CARRIERSPEC, PTN, or both. If neither is specified, the equipment rejects the message. If both are specified, ConX300 rejects the message if they are inconsistent.

CARRIERSPEC specifies the CarrierID of the desired carrier. This can be any combination of upper- and lowercase letters. To omit, specify the Data Item as zero-length.

PTN specifies the Port Number. To omit, specify the Data Item as zero-length.

S3F17 CancelCarrier

```
S3F17 W            /* Cancel Carrier Request ( ) M, H->E */
   <L [5]
      <U4 DATAID>
      <A "CancelCarrier">
      <A CARRIERSPEC>
      <U1 PTN>
      <L>                       /* Attributes */
   > .
```

The host commands that the equipment reject the specified carrier and prepare it for unloading.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it.

`DATAID` is ignored by this equipment.

`CARRIERACTION ("CancelCarrierNotification")` may be specified in any combination of upper- and lowercase letters.

The host must specify `CARRIERSPEC`, `PTN`, or both. If neither is specified, the equipment rejects the message. If both are specified, ConX300 rejects the message if they are inconsistent.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. This can be any combination of upper- and lowercase letters. This is required. The equipment rejects the message if zero-length.

`PTN` specifies the Port Number (optional). To omit, specify the Data Item as zero-length. If specified, the equipment rejects the message if the value is inconsistent with `CARRIERSPEC`.

The equipment will reject the message if `CarrierAccessingStatus` is `IN ACCESS`, `CARRIER COMPLETE`, or `CARRIER STOPPED`.

Attributes are not normally specified in a `CancelCarrier` request, although it is not an error if attributes are specified.

S3F17 CancelCarrierAtPort

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A "CancelCarrierAtPort">        /*CARRIERACTION */
      <A [0..80]CARRIERSPEC>
      <U1 PTN>
      <L>                              /* Attributes */
   > .
```

During Carrier ID Verification or Slot Map Verification, the host instructs the equipment to reject the carrier at the specified port.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it, even if `S3F17` is multi-block.

`DATAID` is ignored by this equipment.

`CARRIERSPEC` should be zero-length. This equipment ignores any value incorrectly specified by the host.

`PTN` specifies the port number. This is required. The equipment will reject the message if zero-length.

S3F17 CancelCarrierNotification

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A "CancelCarrierNotification">         /*CARRIERACTION */
      <A CARRIERSPEC>
      <U1>                                    /* PTN */
      <L>                                     /* Attributes */
   > .
```

The host destroys the prediction of a carrier arrival previously created by a `CarrierNotification`.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it, even if S3F17 is multi-block.

`DATAID` is ignored by this equipment.

`CARRIERACTION ("CancelCarrierNotification")` may be specified in any combination of upper- and lowercase letters.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters. This is required. The equipment will reject the message if it is zero-length.

`PTN` should be zero-length. This equipment ignores any value incorrectly specified by the host.

S3F17 CarrierNotification

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A "CarrierNotification">     /*CARRIERACTION */
      <A CARRIERSPEC>
      <U1>                          /* PTN */
      <L [NumberOfAttributes]
         <L [2]
            <ATTRID>
            <ATTRDATA>
         >
         ...                        /* More Attributes */
      >
   > .
```

The host predicts that the specified CarrierID will arrive at an unspecified port. The host may also provide attributes of the predicted carrier.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it, even if `S3F17` is multi-block.

`DATAID` is ignored by this equipment.

`CARRIERACTION ("CarrierNotification")` may be specified in any combination of upper- and lowercase letters.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters.

`PTN` should be zero-length. This equipment ignores any value incorrectly specified by the host.

`ATTRID` (Attribute ID) may be specified either as an Attribute Name (ASCII) or an Attribute Number (Ux).

`ATTRDATA` (Attribute Data) specifies the value for the attribute specified in `ATTRID`.

The `CarrierNotification` may optionally contain the following Carrier Object Attributes:

- `Capacity`
- `ContentMap`
- `SlotMap`
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if `CfgWIDAngle` is set to `0x01`)

The `CarrierNotification` may not contain any other carrier object attributes.

S3F17 CarrierReCreate

```
S3F17 W            /* CarrierReCreate M,H->E */
   <L [5]
      <U4 DATAID>
      <A "CarrierReCreate">      /* CARRIERACTION */
      <A CARRIERSPEC>            /* Carrier ID */
      <U1 PTN>                   /* Optional if CarrierID specified */
      <L [NumberOfAttributes]    /* Optional (may be zero-length) */
         <L [2]
            <ATTRID>             /* Attribute Name */
            <ATTRDATA>           /* Attribute Value */
         >
         ...                     /* More Attributes */
      >
   > .
```

The host commands the equipment to reprocess a carrier that is ready to unload. The specified carrier must reside on a Load Port with a Transfer State of `ReadyToUnload`. The operation is functionally similar to physically unloading the completed carrier and reloading it into the same Load Port.

The operation destroys the existing Carrier Object, all Substrate Objects, and all Carrier Substrate Location Objects. The Load Port Carrier Association State transits to `Unassociated`. If `NumberOfAttributes` is not `0`, then the `CarrierReCreate` operation performs the functional equivalent of a `Bind` operation using the specified attributes. Finally, the equipment physically re-verifies the Carrier ID and Slot Map.

`DATAID` is ignored by this equipment.

`CARRIERACTION` (`"CarrierReCreate"`) may be specified in any combination of upper- and lowercase letters.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters. This is required. The equipment will reject the message if it is zero-length.

`PTN` should be zero-length. This equipment ignores any value incorrectly specified by the host.

If `NumberOfAttributes` is not `0`, it specifies a list of attributes that are treated as if they were included in a `Bind` message for the reloaded carrier. The `CarrierReCreate` operation will create a new Carrier Object containing the attributes specified here. If `NumberOfAttributes` is `0`, then `CarrierReCreate` does not perform a `Bind` operation and the carrier will be re-loaded using host-based Carrier ID Verification.

`ATTRID` (Attribute ID) may be specified either as an attribute name (ASCII) or an Attribute Number (Ux). The ID must be one of the attributes allowed for an `S3F17 Bind` message.

`ATTRDATA` (Attribute Data) specifies the value for the attribute specified in `ATTRID`.

S3F17 CarrierRelease

```
S3F17 W            /* Carrier Release Request ( ) M, H->E */
   <L [5]
      <U4 DATAID>
      <A "CarrierRelease">
      <A CARRIERSPEC>
      <U1 PTN>
      <L>                        /* Attributes */
   > .
```

The host commands that the equipment allow the specified carrier to unload, as all tag read / write activity is complete.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it.

`DATAID` is ignored by this equipment.

`CARRIERACTION` ("`CarrierRelease`") may be specified in any combination of upper- and lowercase letters.

The host must specify either `CARRIERSPEC`, `PTN`, or both. If neither is specified, the equipment rejects the message. If both are specified, ConX300 rejects the message if they are inconsistent.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters. `CARRIERSPEC` must always be specified except in the case where the ID is not yet known. In this case, `CARRIERSPEC` should be zero-length and `PTN` should be specified.

`PTN` specifies the Load Port number. It is required only in cases where the Carrier ID is not yet known. Otherwise, `PTN` can be zero-length.

S3F17 ProceedWithCarrier

```
S3F17 W            /* Carrier Action Request ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <A "ProceedWithCarrier">      /* CARRIERACTION */
      <A CARRIERSPEC>
      <U1 PTN>
      <L [NumberOfAttributes]
         <L [2]
            <ATTRID>
            <ATTRDATA>
         >
         ...                        /* More Attributes */
      >
   > .
```

During Carrier ID Verification or Slot Map Verification, the host instructs the equipment to proceed with the specified carrier.

This message may be preceded by `S3F15/S3F16 Inquire/Grant`, but this equipment does not require it, even if S3F17 is multi-block.

`DATAID` is ignored by this equipment.

`CARRIERACTION ("ProceedWithCarrier")` may be specified in any combination of upper- and lowercase letters.

`CARRIERSPEC` specifies the CarrierID of the desired carrier. It may be specified in any combination of upper- and lowercase letters.

`PTN` specifies the Port Number, if required. If not required, this can be zero-length.

`ATTRID` (Attribute ID) may be specified either as an Attribute Name (ASCII) or an Attribute Number (Ux). This must be one of the allowed attributes for the service requested by `CARRIERACTION`.

`ATTRDATA` (Attribute Data) specifies the value for the attribute specified in `ATTRID`.

ProceedWithCarrier Type #1

The host sends this type of `ProceedWithCarrier` message after the equipment signals Carrier State Transition #3.

`PTN` may be zero-length, if specified. The equipment will reject the message if the value is inconsistent with `CARRIERSPEC`.

The `ProceedWithCarrier` does not require any Carrier Object attributes. However, the following attributes may be specified:

- `Capacity`
- `ContentMap`
- `SlotMap` (only if `SlotMap` was not specified in previous `S3F17` messages)
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if Equipment Constant `CfgWIDAngle` is set to `0x01`)

The `ProceedWithCarrier` may not contain any other carrier object attributes.

ProceedWithCarrier Type #2

The host sends this type of `ProceedWithCarrier` message after the equipment signals Carrier State Transition #7.

`PTN` may be zero-length, if specified. The equipment will reject the message if the value is inconsistent with `CARRIERSPEC`.

The `ProceedWithCarrier` does not require any Carrier Object attributes. However, the following attributes may be specified:

- `Capacity`
- `ContentMap`
- `SlotMap` (only if `SlotMap` was not specified in previous `S3F17` messages)
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if Equipment Constant `CfgWIDAngle` is set to `0x01`)

The `ProceedWithCarrier` may not contain any other carrier object attributes.

ProceedWithCarrier Type #3

The host sends this type of `ProceedWithCarrier` message after the equipment signals Carrier State Transition #10.

`PTN` may be zero-length, if specified. The equipment will reject the message if the value is inconsistent with `CARRIERSPEC`.

The `ProceedWithCarrier` does not require any Carrier Object attributes. However, the following attributes may be specified:

- `Capacity`
- `ContentMap`
- `SlotMap` (only if `SlotMap` was not specified in previous `S3F17` messages)
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if Equipment Constant `CfgWIDAngle` is set to `0x01`)

The `ProceedWithCarrier` may not contain any other carrier object attributes.

ProceedWithCarrier Type #4

The host sends this type of `ProceedWithCarrier` message after the equipment signals a Carrier ID Read Fail event.

`PTN` specifies the port. This is required. The equipment will reject the message if the value is zero-length.

The `S3F17` message must specify the `PTN`.

The `ProceedWithCarrier` does not require any Carrier Object attributes. However, the following attributes may be specified:

- `Capacity`
- `ContentMap`
- `SlotMap` (only if `SlotMap` was not specified in previous `S3F17` messages)
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if the Equipment Constant `CfgWIDAngle` is set to `0x01`)

The `ProceedWithCarrier` may not contain any other carrier object attributes.

ProceedWithCarrier Type #5

The host sends this type of `ProceedWithCarrier` message after the equipment signals Carrier State Transition #14 and the variable `Reason` contains one of the following values:

- `0 = SLOT MAP VERIFICATION NEEDED`
- `1 = SLOT MAP VERIFICATION BY EQUIPMENT UNSUCCESSFUL`
- `3 = IMPROPER WAFER POSITION IN SLOT`

`PTN` should be zero-length, if specified. The equipment will reject the message if the value is inconsistent with `CARRIERSPEC`.

The `ProceedWithCarrier` does not require any Carrier Object attributes. However, the following attributes may be specified:

- `ContentMap`
- `Usage`
- `WID_Angle` (valid only if the Equipment Constant `CfgWIDAngle` is set to `0x01`)

The `ProceedWithCarrier` may not contain any other carrier object attributes.

ProceedWithCarrier Type #6

The host sends this type of `ProceedWithCarrier` after the equipment signals Carrier State Transition #14 and the variable `Reason` contains the value `2 = SLOT MAP READ FAILURE`.

`PTN` may be zero-length, if specified. The equipment will reject the message if the value is inconsistent with `CARRIERSPEC`.

The `ProceedWithCarrier` must contain the following object attributes.

- `Capacity` (only if `SlotMap` was not specified in previous `S3F17` messages)
- `SlotMap` (only if `SlotMap` was not specified in previous `S3F17` messages)

The `ProceedWithCarrier` may contain the following object attributes.

- `ContentMap` (only if `ContentMap` was not specified in previous `S3F17` messages)
- `SubstrateCount`
- `Usage`
- `WID_Angle` (valid only if Equipment Constant `CfgWIDAngle` is set to `0x01`)

The `ProceedWithCarrier` may not contain any other carrier object attributes.

S3F18 Carrier Action Acknowledge

```
S3F18            /* Carrier Action Acknowledge ( ) S,H<-E */
   <L [2]
      <U1 CAACK>
      <L [NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...                  /* More Errors */
      >
   > .
```

This message indicates the success or failure of S3F17 ProceedWithCarrier (on page 7-15).

`CAACK` will contain one of the following values:

- `0 = NORMAL. NO ERRORS.`
- `1 = REJECTED. S3F17 WAS AN INVALID COMMAND.`
- `3 = REJECTED. S3F17 CONTAINED INVALID DATA OR ARGUMENTS.`
- `4 = NORMAL. Acknowledge, request will be performed with completion signaled later by an event.`
- `5 = REJECTED. INVALID STATE. THE EQUIPMENT WAS IN A STATE DURING WHICH THE S3F17 COMMAND WAS NOT VALID.`

If no errors were found, `NumberOfErrors = 0`.

If `CAACK` indicates an error, then `ERRCODE` will contain an error code, and `ERRTEXT` will contain associated text.

S3F23 Change Access Mode For Port List

```
S3F23 W            /* Change Access Mode for Port List ( ) S,H->E */
   <L [2]
      <A ACCESSMODE>            /* "Manual" or "Auto" */
      <L [NumberOfPorts]
         <U1 PTN>            /* Port Number */
         ...
      >
   > .
or
   <L [3]
      <A ACCESSMODE> /* "Manual" or "Auto" */
         <L [NumberOfPorts]
         <U1 PTN> /* Port Number */
         <L> /* No PARAM */
      >
   > .
```

NOTE

This message is not in a SEMI standard format. However, this equipment supports it to maintain compatibility with some host computers.

The host changes the Access Mode (`Manual` or `Automatic`) for the specified list of Load Ports.

`ACCESSMODE` specifies the desired new mode (`"Manual"` or `"Auto"`). The host can specify the mode in any combination of upper- and lowercase letters.

All Ports specified in the list of Port Numbers are changed to the new Access Mode.

S3F24 Change Access Mode For Port List Acknowledge

```
S3F24            /* Cancel Access Mode For Port List Acknowledge( )S,H<-E */
   <L [2]
      <U1 CAACK>
      <L [NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...                        /* More Errors */
      >
   > .
```

This message indicates success or failure of S3F23 Change Access Mode For Port List (on page 7-20).

If no errors were found, `CAACK=0` and `NumberOfErrors = 0`.

S3F25 Port Action Request

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A PORTACTION>               /* Desired Action */
      <U1 PTN>                     /* Port Number */
      <L [NumberOfParameters]
         <L [2]
            <A PARAMNAME>
            <PARAMVAL>
         >
         ...                       /* More Parameters */
      >
   > .
```

The host sends this message to command the equipment to perform an action on a specified port.

`PORTACTION` specifies the operation to be performed and must be assigned one of the following values. It can be specified in any combination of upper- and lowercase letters.

- `"CancelReservationAtPort"`
- `"ChangeAccess"`
- `"ChangeServiceStatus"`
- `"In Service"`
- `"InService"`
- `"Out Of Service"`
- `"OutOfService"`
- `"ReserveAtPort"`

S3F25 CancelReservationAtPort

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "CancelReservationAtPort">    /* PORTACTION */
      <U1 PTN>                         /* Port Number */
      <L>                              /* No PARAM */
   > .
```

The host sends this message to cancel a reservation scheduled by a S3F25 ReserveAtPort (on page 7-24).

`PTN` specifies the port.

S3F25 Change Access

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "ChangeAccess">               /* PORTACTION */
      <U1 PTN>                         /* Port Number */
      <L [1]                           /* Must be exactly one PARAM */
         <L [2]
            <A "AccessMode">           /* PARAMNAME */
            <U1 PARAMVAL>
         >
      >
   > .
```

NOTE

This message is not in a SEMI standard format. However, this Equipment supports it to maintain compatibility with some host computers.

The host sends this message to change the `AccessMode` of the port specified by `PTN`.

`AccessMode PARAMVAL` values are:

- `0 = MANUAL`
- `1 = AUTOMATIC`

S3F25 Change Service Status

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "ChangeServiceStatus">        /* PORTACTION */
      <U1 PTN>                         /* Port Number */
      <L [1]                           /* Must be exactly one PARAM */
         <L [2]
            <A "ServiceStatus">        /* PARAMNAME */
            <U1 PARAMVAL>
         >
      >
   > .
```

The host sends this message to change the `ServiceStatus` of the port specified by `PTN`.

`ServiceStatus PARAMVAL` values are:

- `0 = OUTOFSERVICE`
- `1 = INSERVICE`

S3F25 In Service

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "In Service">                          /* PORTACTION */
      <U1 PTN>                                  /* Port Number */
      <L>                                       /* No PARAM */
   > .
```

The host sends this message to change the `In Service` state of the port specified by `PTN`.

S3F25 InService

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "InService">                           /* PORTACTION */
      <U1 PTN>                                  /* Port Number */
      <L>                                       /* No PARAM */
   > .
```

The host sends this message to change the `InService` state of the port specified by `PTN`.

S3F25 Out Of Service

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      "Out Of Service">                         /* PORTACTION */
       PTN>                                     /* Port Number */
                                                /* No PARAM */
   > .
```

The host sends this message to change the `Out Of Service` state of the port specified by `PTN`.

S3F25 OutOfService

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "OutOfService">                        /* PORTACTION */
      <U1 PTN>                                  /* Port Number */
      <L>                                       /* No PARAM */> .
   > .
```

The host sends this message to change the `OutOfService` state of the port specified by `PTN`.

S3F25 ReserveAtPort

```
S3F25 W            /* Port Action Request ( ) S,H->E */
   <L [3]
      <A "ReserveAtPort">                        /* PORTACTION */
      <U1 PTN>                                   /* Port Number */
      <L>                                        /* No PARAM */
   > .
```

The host sends this message to reserve a port specified by `PTN`.

S3F26 Port Action Acknowledge

```
S3F26            /* Port Action Acknowledge ( ) S,H,-E */
   <L [2]
      <U1 CAACK>
      <L [NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...                        /* More Errors */
      >
   > .
```

This message indicates success or failure of S3F25 ReserveAtPort (on page 7-24).

If no errors were found, `CAACK = 5` or `CAACK = 4`, and `NumberOfErrors = 0`.

S3F27 Change Access

```
S3F27 W            /* Change Access ( ) S,H->E */
   <L [2]
      <U1 ACCESSMODE>
      <L [NumberOfPorts]
         <U1 PTN>                  /* Port Number */
         ...                       /* More Ports */
      >
   > .
```

or

```
    <L [2]
      <U1 ACCESSMODE>
      <L [0]/* All Ports */
      >
   > .
```

The host sends this message to change the ACCESSMODE of the port list. Values are:

- 0 = MANUAL
- 1 = AUTO

PTN specifies a port number. All ports specified in the list of port numbers are changed to the new ACCESSMODE.

S3F28 Change Access Acknowledge

```
S3F28            /* Change Access Acknowledge ( ) S,H<-E */
   <L [2]
      <U1 CAACK>
      <L [NumberOfErrors]
         <L [3]
            <U1 PTN>
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...                      /* More Errors */>
   > .
```

This message indicates success or failure of S3F27 Change Access (on page 7-25).

If no errors were found, CAACK = 0 and NumberOfErrors will be 0.

PTN indicates the number of the Load Port for the failed operation. ERRCODE and ERRTEXT indicate the error for that port.

S3F29 Carrier Tag Read Request

```
S3F29 W            /* Carrier Tag Read Request (CTRR) M,H->E */
   <L [4]
      <A LOCID>
      <A CARRIERSPEC>
      <A DATASEG>
      <U4 DATALENGTH>
   > .
```

This is a host request to read data from the electronic tag on the carrier.

`LOCID` specifies the Carrier Location that contains a tag reader.

`CARRIERSPEC` specifies a Carrier ID.

Either `LOCID` or `CARRIERSPEC` must be specified. If both are specified, they must be consistent.

`DATASEG` indicates the specific section of the Tag Data to read. A zero-length value specifies all sections.

`DATALENGTH` indicates the number of data bytes to read.

`DATASEG` and `DATALENGTH` values may be further restricted by the Tag hardware used.

S3F30 Carrier Tag Read Data

```
S3F30 W            /* Carrier Tag Read (CTRD) S,H<-E */
   <L [2]
      <A DATA>
      <L [2]
         <U1 CAACK>
         <L [NumberofErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT
            >
            ...                    /* More Errors */
         >
      >
   > .
```

This message returns the requested Carrier Tag data.

`DATA` is Tag Data read in ASCII format. The value is zero-length if nothing has been read or if there is a Carrier Tag Read error.

If there are no errors, `CAACK = 0` and `NumberofErrors = 0`.

Any error code value returned by the equipment that is in the range defined by the ConX300 software (including the SEMI-E5 defined errors) can be reported as any other ConX300 error. If this equipment returns an error beyond the currently ConX300-defined range, the error code will be reported as an "Equipment-specific error (XX) reported" along with a generic E5-defined error, "Equipment failed during processing."

```
<S3F30
      <L[2/1]
         <A[0/1]>
         <L[2/1]
            <I4[1/1] 2>
            <L[2/1]
               <L[2/1]
                  <U2[1/1] 22>
                  <A[24/1] "Failed during processing">
               >
               <L[2/1]
                  <U2[1/1] 423>
                  <A[39/1] "Equipment-specific error (423) reported">
               >
            >
         >
      >
   >
```

S3F31 Carrier Tag Write Data Request

```
S3F31            /* Carrier Tag Write Data Request (CTWDR) M,H->E */
   <L [5]
      <A LOCID>
      <A CARRIERSPEC>
      <A DATASEG>
      <U4 DATALENGTH>
      <A DATA>
   > .
```

This host message writes data to the electronic tag of a carrier.

`LOCID` specifies the Carrier Location that contains a tag reader.

`CARRIERSPEC` specifies a Carrier ID.

Either `LOCID` or `CARRIERSPEC` must be specified. If both are specified, they must be consistent.

`DATASEG` indicates the specific section of the Tag Data to write. A zero-length value specifies all tag sections.

`DATALENGTH` is ignored.

`DATA` is the data to be written.

S3F32 Carrier Tag Write Data Acknowledge

```
S3F32            /* Carrier Tag Write Data Acknowledge (CTWDA) S,H<-E */
   <L [2]
      <U1 CAACK>
      <L [NumberofErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT
         >
         ...                          /* More Errors */
      >
   > .
```

This message acknowledges the result of writing Carrier Tag data.

If there are no errors, `CAACK = 0` and `NumberofErrors = 0`.

Any error code value returned by the equipment that is in the range defined by ConX300 software (including the SEMI-E5 defined errors) can be reported as any other ConX300 error. If this equipment returns an error beyond the currently ConX300-defined range, the error code will be reported as an "Equipment-specific error (XX) reported" along with a generic E5-defined error, "Equipment failed during processing."

S14F1 Get Attribute Request

```
S14F1 W            /* GetAttr Request (GAR) S,H->E */
   <L [5]
      <A>                          /* OBJSPEC (null) */
      <A OBJTYPE>
      <L [NumberOfObjIDs]
         <A OBJID>
         ...
      >
      <L [NumberOfQualifiers]
         <L [3]
         <ATTRID>
         <ATTRDATA>
         <U1 ATTRRELN>
         >
         ...
      >
      <L [NumberOfAttributes]
         <ATTRID>
         ...
      >
   > .
```

The host sends this message to search for objects of a specified type, identifies the objects, and returns a specified set of attributes from those objects. For this equipment, the message is Host-to-Equipment only.

The host can restrict the search by specifying a set of one or more OBJIDs of interest and by specifying a set of Attribute Qualifiers. These Qualifiers select only objects with specified Attribute Values.

For this equipment, the host should always specify a zero-length OBJSPEC.

OBJTYPE specifies the type (class) of object of interest, and is required. The host can specify OBJTYPE in any combination of upper- and lowercase letters. The OBJTYPE must be the one shown in the Object Dictionary.

If NumberOfObjID = 0, the request is for all objects of the specified OBJTYPE. Otherwise, specify a list of one or more OBJIDs to specify the subset of objects of interest. For example, if the host is interested in only one specific object, specify its OBJID here. The host can specify the OBJID in any combination of upper- and lowercase letters.

Qualifiers can be used to filter for objects with certain attribute values. If NumberOfQualifiers = 0, there is no filter. Otherwise, specify a list of qualifiers. Each qualifier is specified as follows:

- ATTRID can contain either (1) the attribute name (ASCII) or (2) the attribute number (Ux), and specifies an attribute for which to qualify the search. The host can specify an attribute name in any combination of upper- and lowercase letters.
- ATTRDATA is a value for the compare. The format and value must be compatible with the attribute specified by ATTRID.

- ATTRRELN specifies a relationship ("Equal To," "Greater Than," and so on.). A qualification selects a target object if the following statement is true:

  (ATTRDATA) (ATTRRELN) (AttributeValue from target object)

If ATTRRELN is omitted, ATTRRELN is zero-length or the enclosing List has only two elements, the relationship of equality is intended.

If several qualifiers are specified, a target object must be selected by all specified qualifiers to be selected. If the Object fails any qualifier or if the object is excluded by the list of OBJIDs, the Object is rejected.

The host can instruct the equipment to return only specified object attributes. If NumberOfAttributes = 0, the equipment returns all attributes for the selected Objects. ATTRID is the Attribute Name (ASCII) or the Attribute Number (Ux).

ATTRRELN values

The following are attribute comparisons allowed for ATTRRELN in the S14F1 Get Attribute Request command.

Code	ATTRRELN	Comments
0	Equal To	This relationship is TRUE if ATTRDATA is equal to the attribute data. ATTRDATA must be one of the formats: A, J, B, M, BOOLEAN, Ix[1], Ux[1], or Fx[1]. It must have one value and cannot be zero-length or arrays. If ATTRDATA is format A (ASCII), Attribute Data must have the same format, and the comparison is as follows: If ATTRDATA contains wild characters (* or ?), a pattern match is performed, as described in E39, including the special case where ATTRIDATA * is considered not equal to attribute data <A[0]>. If ATTRDATA does not contain wild characters, the two strings are considered equal if they have the same length and each byte of the first string is equal to the corresponding byte of the second string. All alphabetic characters (A through Z) are compared as if they were lowercase, so lowercase and uppercase alphabetic characters are considered equivalent. If ATTRDATA is J, B, M, or BOOLEAN, attribute data must have exactly the same format and the compare is as follows: The two strings are considered equal if they have the same length and each byte of the first string is equal to the corresponding byte of the second string. If ATTRDATA format is any Ix (signed integer), then attribute data may be any Ix[0] or Ix[1]. The attribute data may not contain an array of more than one value. The values are considered equal if their number of values is equal and the two values compare equal numerically.
0	Equal To	If ATTRDATA format is any Ux (unsigned integer), then the Attribute Data may be any Ux[0] or Ux[1]. Attribute Data may not contain an array of more than one value. The values are considered equal if their number of values is equal and the two values compare equal numerically. If ATTRDATA format is any Fx (floating-point), then the Attribute Data may be any Fx[0] or Fx[1]. The Attribute Data may not contain an array of more than one value. The values are considered equal if their number of values is equal and the two values compare equal numerically.
1	Not Equal To	This relationship is TRUE if ATTRDATA is not equal to Attribute Data, using the same comparison rules as Equal To.

Code	ATTRRELN	Comments
2	Less Than	This relationship is TRUE if ATTRDATA is less than the Attribute Data. ATTRDATA must be one of the formats: A, J, B, M, BOOLEAN, Ix[1], Ux[1], or Fx[1]. Ix, Ux, and Fx formats must have exactly one value and cannot be zero-length or consist of arrays. If ATTRDATA is format A (ASCII), it may not contain wild characters. Attribute Data must have the same format, and the comparison is as follows: The two strings are compared byte-for-byte and left to right until reaching the end of at least one of the two strings. The first byte that compares greater causes that string to be considered greater than the other string. If the strings are of different lengths but compare equal up to the length of the shorter string, the longer string is considered greater. All alphabetic characters (A through Z) are compared as if they were lowercase, so lowercase and uppercase alphabetic characters are considered equivalent. If ATTRDATA format is J, B, M, or BOOLEAN, the Attribute Data must have exactly the same format. The comparison is like that for ASCII format, except that there are no special considerations for alphabetic characters. If ATTRDATA format is any Ix (signed integer), then Attribute Data may be any Ix[0] or Ix[1]. Attribute Data may not contain an array of more than one value. If both sides have one value, the values are compared numerically. If Attribute Data is zero-length, then it is considered less than ATTRDATA, which must have exactly one value. If ATTRDATA format is any Ux (unsigned integer), then attribute data may be any Ux[0] or Ux[1]. Attribute data may not contain an array of more than one value. If both sides have one value, the values are compared numerically. If attribute data is zero-length, then it is considered less than ATTRDATA, which must have exactly one value. If ATTRDATA format is any Fx (floating-point), then attribute data may be any Fx[0] or Fx[1]. Attribute Data may not contain an array of more than one value. If both sides have one value, the values are compared numerically. If Attribute Data is zero-length, then it is considered less than ATTRDATA, which must have exactly one value.
3	Less Than or Equal To	This relationship is TRUE if ATTRDATA is less than or equal to Attribute Data, using the same rules as Less Than.
4	Greater Than	This relationship is TRUE if ATTRDATA is greater than Attribute Data, using the same rules as Less Than.
5	Greater Than or Equal To	This relationship is TRUE if ATTRDATA is greater than or equal to Attribute Data, using the same rules as Less Than.
6	Present	This relationship is TRUE if the Attribute Value has a length greater than zero. ATTRDATA is ignored for this relationship.
7	Absent	This relationship is TRUE if the Attribute Value has a length of zero. ATTRDATA is ignored for this relationship.

Code	ATTRRELN	Comments
8	Contained	This relationship is TRUE if ATTRDATA is equal to at least one of the set of values of the Attribute Value List of the candidate object. The comparison uses the same rules as the Equal To relationship, including wild characters. ATTRDATA must be one of the formats A, J, B, M, BOOLEAN, Ix[1], Ux[1], or Fx[1]. It must have exactly one value and cannot consist of arrays. If ATTRDATA is A, J, B, M, or BOOLEAN, then the attribute value must be a single-level list (L) containing elements in exactly the same format as ATTRDATA. If ATTRDATA is any format Ix, then the attribute value must be a single-level list (L) containing elements in any format Ix[0] or Ix[1]. If ATTRDATA is any format Ux, then the attribute value must be a single-level list (L) containing elements in any format Ux[0] or Ux[1]. If ATTRDATA is any format Fx, then attribute value must be a single-level list (L) containing elements in any format F[0] or Fx[1].
9	Not Contained	This relationship is TRUE if ATTRDATA is Equal To none of the set of values of the candidate object Attribute Values. The comparison uses the same rules as the Equal To and Contained relationships, including wild characters.

S14F2 Get Attribute Response

```
S14F2            /* GetAttr Data (GAD) M,H<-E */
   <L [2]
      <L [NumberOfObjects]
         <L [2]
            <A OBJID>
            <L [NumberOfAttributes]
               <L [2]
                  <A ATTRID>
                  <ATTRDATA>
               >
               ...
            >
         >
         ...
      >
      <L [2]
         <U1 OBJACK>
         <L [NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...
         >
      >
   > .
```

The equipment returns the requested Attribute ID and values for the objects requested in S14F1 Get Attribute Request (on page 7-29).

If `NumberOfObjects = 0`, the equipment found no objects matching the search criteria specified in `S14F1`.

The order of attributes in `S14F2` corresponds to the order of attributes requested in `S14F1`.

`ATTRID` always contains the Attribute Name (ASCII), never the Attribute Number (Ux).

If no errors were found, `OBJACK = 0` and `NumberOfErrors = 0` (zero-length list).

S14F1/S14F2 GetAttr Example 1

This example locates the carrier with an ID of `CARR75` within the equipment.

```
S14F1 W            /* GetAttr Request (GAR) S,H->E */
   <L [5]
      <A>                           /* OBJSPEC (null) */
      <A "Carrier">                 /* OBJTYPE */
      <L
         <A "CARR75">               /* OBJID */
      >
      <L>                           /* No Qualifiers */
      <L                            /* Attributes Desired */
         <A "LocationID">
      >
   > .

S14F2               /* GetAttr Data (GAD) M,H<-E */
   <L [2]
      <L [1]
         <L [2]
         <A "CARR75">
            <L
               <L [2]
                  <A "LocationID">
                  <A "LP2">
               >
            >
         >
      >
      <L [2]
         <U1 0>                     /* OBJACK=0, No errors */
         <L>                        /* No Errors */
      >
   > .
```

S14F1/S14F2 GetAttr Example 2

This example locates all carriers within the equipment with a capacity of 25 wafers and containing more than three wafers.

Note that the second qualifier must be stated as "`3 is less than the Carrier Object's SubstrateCount`".

```
S14F1 W            /* GetAttr Request (GAR) S,H->E */
   <L [5]
      <A>                           /* OBJSPEC (null) */
      <A "Carrier">                 /* OBJTYPE */
      <L>                           /* Search all Carrier Objects */
      <L                            /* Qualifiers to match */
         <L [3]
            <A "Capacity">          /* ATTRID */
            <U1 25>                 /* ATTRDATA */
            <U1 0>                  /* ATTRRELN="EqualTo" */
         >
         <L [3]
            <A "SubstrateCount">    /* ATTRID */
            <U1 3>                  /* ATTRDATA */
            <U1 2>                  /* ATTRRELN="LessThan" */
         >
      >
      <L                            /* Attributes Desired */
         <A "ObjID">
      >
   > .

S14F2              /* GetAttr Data (GAD) M,H<-E */
   <L [2]
      <L
         <L [2]
            <A "CARR43">            /* OBJID */
            <L                      /* Attributes requested */
               <L [2]
                  <A "Objid">
                  <A "CARR43">
               >
            >
         >
         <L [2]
            <A "CARR76">            /* OBJID */
            <L                      /* Attributes requested */
               <L [2]
                  <A "Objid">
                  <A "CARR76">
               >
            >
         >
      >
      <L [2]
         <U1 0>                     /* OBJACK=0, No errors */
         <L>                        /* No Errors */
      >
   > .
```

S14F1/S14F2 GetAttr Example 3 for EPT

In this example, the host asks the equipment to display all EPT modules.

```
S14F1  W  /* GetAttr Request (GAR) S,H->E */
   <L[5]
      <A>  /* OBJSPEC (null) */
      <A  "EPTTracker"> /* OBJTYPE */
      <L>  /* OBJID */
      <L>  /* No Qualifiers */
      <L  /* Attributes Desired */
         <A "EPTElementName">
         <A "EPTElementType">
      >
   > .
S14F2  /* GetAttr Data (GAD) M,H<-E */
   <L[2]
      <L[NumberOfEPTModules]
         <L[2]
            <A "EPTTracker1">
            <L /* Attributes */
               <L[2]
                  <A "EPTElementName">
                  <A "ChamberA">
               >
               <L[2]
                  <A "EPTElementType">
                  <U1 0> /* Production Module */
               >
            >
         >
         ... /* More EPT Modules */
      >
      <L [2]
         <U1 0> /* OBJACK=0, No errors */
         <L> /* No Errors */
      >
   > .
```

S14F1/S14F2 GetAttr Example 4 for EPT

In this example, the host asks the equipment to display all `EFEM/LoadPort` EPT modules that are currently `BLOCKED`, since these modules do not affect the EPT equipment-level state.

```
S14F1  W            /* GetAttr Request (GAR) S,H->E */
   <L[5]
      <A> /* OBJSPEC (null) */
      <A "EPTTracker"> /* OBJTYPE */
      <L> /* OBJID */
      <L> /* Selection Qualifiers */
         <L[3]
            <A "EPTElementType"> /* Attribute Name */
            <U1 1> /* EFEM/LoadPort Type */
            <U1 0> /* ATTRRELN="EqualTo" */
         >
         <L[3]
            <A "EPTState"> /* Attribute Name */
            <U1 2> /* 2=BLOCKED */
            <U1 0> /* ATTRRELN="EqualTo" */
         >
      <L /* Attributes Desired */
         <A "EPTElementName">
         <A "BlockedReason">
      >
   > .

S14F2 /* GetAttr Data (GAD) M,H<-E */
   <L[2]
      <L[NumberOfEPTModules]
         <L[2] /* A Module */
            <A "EPTTracker3">
            <L /* Attributes */
               <L[2]
                  <A "EPTElementName">
                  <A "LoadPort1">
               >
               <L[2]
                  <A "BlockedReason">
                  <U1 2> /* 2=Safety Threshold */
               >
            >
         >
         ... /* More EPT Modules */
      >
      <L [2]
         <U1 0> /* OBJACK=0, No errors */
         <L> /* No Errors */
      >
   > .
```

S14F3 Set Attribute Request

```
S14F3 W            /* SetAttr Request (SAR) S,H->E */
   <L [4]
      <A> /* OBJSPEC (null) */
      <A OBJTYPE>
      <L [NumberOfObjects]
         <A OBJID >
         ...
      >
      <L [NumberOfAttributes]
         <L [2]
            <ATTRID>
            <ATTRDATA>
         >
         ...
      >
   > .
```

The host sends this message to the equipment to set the specified values for the specified set of attributes in all objects of the specified type that match the selection criteria.

For this equipment, the host should always specify a zero-length `OBJSPEC`.

The host can specify `OBJTYPE` in any combination of upper- and lowercase letters.

The list of `OBJID`s specifies the Objects whose attributes should be set.

If `NumberOfObjects = 0`, the specified attributes will be set for all Objects of the specified `OBJTYPE`.

`OBJID` specifies the ID of a desired object instance. The host can specify `OBJID` in any combination of upper- and lowercase letters.

`ATTRID` identifies an attribute that is to be changed. The host can specify `ATTRID` as either the Attribute Name (ASCII) or the Attribute Number (Ux). The host can specify the Attribute Name in any combination of upper- and lowercase letters. Only attributes defined as Read-Write (RW) can be changed by this message. Attributes defined as Read-Only (RO) cannot.

`ATTRDATA` format and value must be compatible with the attribute specified by `ATTRID`.

S14F4 Set Attribute Response

```
S14F4            /* SetAttr Data (SAD) H<-E */
   <L [2]
      <L [NumberOfObjects]
         <L [2]
            <A OBJID>
            <L [NumberOfAttributesSet]
               <L [2]
                  <A ATTRID>
                  <ATTRDATA>
               >
               ...
            >
         >
         ...
      >
      <L [2]
         <U1 OBJACK>
         <L [NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...
         >
      >
   > .
```

The equipment acknowledges that the attributes for the specified objects have been set as requested in S14F3 Set Attribute Request (on page 7-39), or returns errors if attributes were not set as requested.

The order of attributes in `S14F4` corresponds to the order specified by the host in `S14F3`.

If no errors were found, `OBJACK = 0` and `NumberOfErrors = 0`.

If `NumberOfAttributesSet = 0` for any object, the object was not found.

`ATTRID` always contains the Attribute Name (ASCII), but not the Attribute Number (Ux).

S14F5 GetType Request

```
S14F5 W          /* GetType Request () S,H->E */
   <A>           /* OBJSPEC (null) */
   > .
```

The host sends this message to request the object types supported by this equipment. The host should always specify a zero-length `OBJSPEC`.

S14F6 GetType Data

```
S14F6 W            /* Get Data Type (GDT) */
   <L[2]
      <L [NumberOfObjects]
         <A OBJID>
         ...
      >
      <L [2]
         <U1 OBJACK>
         <L[NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            ...
            >
         >
      >
   > .
```

S14F7 Get Attribute Names Request

```
S14F7 W            /* GetAttrName Request (GANR) S,H->E */
   <L [2]
      <A>          /* OBJSPEC (null) */
      <L [NumberOfTypes]
         <A OBJTYPE>
         ...
      >
   > .
```

The host requests the equipment to send names of attributes for Objects of the specified types.

This equipment never sends this message to the host.

For this equipment, the Host should always specify a zero-length `OBJSPEC`.

If `NumberOfTypes = 0`, the equipment will return all object types from the Object Dictionary (on page 2-1) in S14F8 Get Attribute Names Response (on page 7-42).

The host can specify `OBJTYPE` in any combination of upper- and lowercase letters. The `OBJTYPE` must be one of the types shown in the Object Dictionary (on page 2-1).

S14F8 Get Attribute Names Response

```
S14F8            /* GetAttrName Data (GAND) M,H<-E */
   <L [2]
      <L [NumberOfTypes]
         <L [2]
            <A OBJTYPE>
            <L [NumberOfAttributes]
               <A ATTRID>
               ...
            >
         >
         ...
      >
   <L [2]
      <U1 OBJACK>
      <L [NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...
      >
   > .
```

The equipment sends the Attribute Names for the Object Types specified in S14F7 Get Attribute Names Request (on page 7-41).

If `NumberOfTypes = 0`, there were no Object Types matching the search criteria in the `S14F7` message.

`ATTRID` always contains the Attribute Name (ASCII), but not the Attribute Number (Ux).

For each `OBJTYPE`, the `ATTRID`s are returned in order by ascending Attribute Number. From the results, the host can determine the relationship between Attribute Number and Attribute Name. The first `ATTRID` in the list is Attribute Number `1`, the next is `2`, and so on.

If no errors were found, `OBJACK = 0` and `NumberOfErrors = 0`.

S14F9 Create Object Request (Create Control Job)

```
S14F9 W            /* Create Object Request (COR) S,H->E */
   <L [3]
      <A>                           /* OBJSPEC */
      <A "ControlJob">              /* OBJTYPE */
      <L [AttributeCount]
         <L [2]
            <A ATTRID>
            <ATTRDATA>
         >
         ...
      >
   > .
```

The host requests the equipment to create the specified Control Job Object.

OBJSPEC is normally zero-length. It can contain the value <A "Equipment"> in any combination of upper- or lowercase letters. For compatibility with older host computer software, OBJSPEC may also contain the Control Job ID of the Control Job being created.

OBJTYPE specifies "ControlJob." The host can specify OBJTYPE in any combination of upper- and lowercase letters.

The host specifies the attributes of the new Control Job Object using ATTRID and ATTRDATA, which must be appropriate for the object being created.

The host can specify ATTRID in any combination of upper- and lowercase letters. Only the following control job attributes may be specified:

ATTRID	Description
ObjID	Can be omitted if the OBJSPEC specifies the name of the Control Job being created.
CarrierInputSpec	Can be omitted.
DataCollectionPlan	Can be omitted. Default is <A>.
MtrlOutByStatus	Can be omitted.
MtrlOutSpec	Can be omitted.
PauseEvent	Can be omitted.
ProcessingCtrlSpec	Must be specified.
ProcessOrderMgmt	Can be omitted. Default is LIST.
StartMethod	Can be omitted. Default is AUTOSTART.

The following Control Job Attributes may not be specified in the list of attributes in this message.

ATTRID	Description
ObjType	Object type.
CurrentPrJob	List of active Process Jobs in this Control Job.
State	Current State of the Control Job.

If ObjID is specified in the list of Attributes, then its value will be used as the Control Job ID of the created Control Job, and OBJSPEC in S14F9 will be ignored. If ObjID is omitted from the list of attributes, then the value specified in OBJSPEC in S14F9 will be used as the Control Job ID of the created Control Job. In either case, the Control Job ID must conform to the format rules for ObjID.

S14F9 Create Object Request (Create Substrate)

```
S14F9 W            /* Create Object Request (COR) S,H->E */
   <L [3]
      <A>                           /* OBJSPEC */
      <A "Substrate">               /* OBJTYPE */
      <L [AttributeCount]
         <L [2]
            <A ATTRID>
            <ATTRDATA>
         >
         ...
      >
   > .
```

The host requests the equipment to create a Substrate Object.

OBJSPEC is normally zero-length. It can contain the value <A "Equipment"> in any combination of upper- or lowercase letters. For compatibility with older host computer software, OBJSPEC may also contain the substrate ID of the substrate being created.

OBJTYPE specifies "Substrate." The host can specify OBJTYPE in any combination of upper- and lowercase letters.

The host specifies the attributes of the new Substrate Object using ATTRID and ATTRDATA, which must be appropriate for the object being created.

The host can specify ATTRID in any combination of upper- and lowercase letters. Only the following control job attributes may be specified:

ATTRID	Description
ObjID	Can be omitted if the OBJSPEC specifies the name of the substrate being created.
BatchLocID	Can be omitted. Must be omitted if SubstLocID is specified.
LotID	Can be omitted.
MaterialStatus	Can be omitted.
SubstDestination	Can be omitted.
SubstHistory	Can be omitted.
SubstLocID	Can be omitted. Must be omitted if BatchLocID is specified.
SubstPosInBatch	Can be omitted. Must be omitted if SubstLocID is specified.
SubstProcState	Can be omitted.

ATTRID	Description
SubstSource	Can be omitted.
SubstState	Can be omitted.
SubstType	Can be omitted.
SubstUsage	Can be omitted.

The following Substrate attribute may not be specified in the list of attributes in the message.

ATTRID	Description
ObjType	Object type.

If ObjID is specified in the list of Attributes, then its value will be used as the Substrate ID of the created Substrate, and OBJSPEC in S14F9 will be ignored. If ObjID is omitted from the list of attributes, then the value specified in OBJSPEC in S14F9 will be used as the Substrate ID of the created Substrate. In either case, the Substrate ID must conform to the format rules for ObjID.

S14F10 Create Object Acknowledge

```
S14F10            /* CreateObject Ack (CAO)   M,H<-E */
   <L [3]
      <A CtlJobID>                /* OBJSPEC */
      <L [NumberOfAttributes]
         <L [2]
            <A ATTRID>
            <ATTRDATA>
         >
         ...
      >
      <L [2]
         <U1 OBJACK>
         <L [NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...
         >
      >
   > .
```

This message indicates the success or failure of S14F9 Create Object Request.

OBJSPEC returns the Control Job ID of the created object. If OBJSPEC is zero-length, the create operation failed.

If the create request was successful, NumberOfAttributes returns a list showing the Attribute IDs and Attribute Data for the new object. If the request failed, NumberOfAttributes = 0.

If no errors were found, OBJACK = 0 and NumberOfErrors = 0.

S14F11 Delete Object Request (partial implementation)

```
S14F11 W            /* Delete Object Request S,H->E */
   <L[2]
      <A> /* OBJSPEC */
      <L[numberOfAttributes]
         <L[2]
            <A ATTRID>
            <ATTRDATA>
         >
         ...
      >
   >.
```

The host sends this message to request the equipment to delete the specified Object.

`OBJSPEC` is required. It must contain `OBJTYPE` with format `<OBJTYPE:OBJID>`. `OBJTYPE` can be specified as a combination of upper- and lowercase letters. `OBJID` is not required if specified as an attribute. If `OBJID` is not in the list of attributes, then it must be specified in `OBJSPEC`.

The list of attributes (`ATTRID` and `ATTRDATA`) is optional, but it can be used as filtering criteria for object deletion. If attributes are specified, then these attributes within the specified Object must be defined and their values must match the attributes from the message. If not, the delete operation will not be performed.

Only `Substrate` and `Control Job` object types are supported for this release.

S14F12 Delete Object Acknowledge (partial implementation)

```
S14F12            /* Delete Object Acknowledge M,H<-E */
   <L[2]
      <L[NumberOfAttributes]
         <L[2]
            <A ATTRID>
            <ATTRDATA>
         >
         ...
      >
   <L [2]
      <U1 OBJACK>
      <L[NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...
      >
      >
   > .
```

The message indicates the success or failure of `S14F11`.

If the delete request is successful, `NumberOfAttributes` returns a list showing the attribute IDs and Attribute Data for the object just deleted, but only those corresponding to the attributes in the `S14F11` message (if specified). Otherwise, `NumberOfAttributes = 0`.

If no errors were found, `OBJACK = 0` and `NumberOfErrors = 0`.

S14F19 Generic Service Request (UpdateSubstrateObject)

```
S14F19 W            /* Create Object Request (GSR) S,H->E */
   <L[5]
      <U1 DATAID>
      <U1 OPID>
      <A "Substrate:OBJID">
      <A "UpdateSubstrateObject">
      <L [ServiceParameterCount]
         <L[2]
            <A "ObjectAction">
            <A "UpdateSubstrateObject">
         >
         <L[2]
            <A "ObjSpec">
            <A "Substrate:OBJID">
         >
         <L[2]
            <A "OperationID">
            <U1 OPID>
         >
         <L[2]
            <A "SubstrateObjectAttributes">
            <L[AttributeCount]
               <L[2]
                  <A ATTRID>
                  <ATTRDATA>
               >
               ...
            >
         >
      >
   > .
```

The host requests the equipment to create or update the specified Substrate Object.

Any value can be specified for `DATAID` and `OPID`. They are ignored by ConX300.

`OBJSPEC` is required. It must contain the Substrate Type and Substrate ID of the Substrate being created or updated. The only format accepted in this message is <`A "Substrate:OBJID`"> in any combination of upper- and lowercase letters.

The host specifies the `SVCNAME` of the service requested. The only accepted value is "`UpdateSubstrateObject`" in any combination of upper- and lowercase letters.

The host specifies the service parameters for the generic service request using `SPNAME` and `SPVAL` in any combination of upper- and lowercase letters. Only the following service parameters may be specified:

SPNAME	SPVAL
`ObjectAction`	Required. Must be "`UpdateSubstrateObject`."
`ObjSpec`	Required.

OperationID	Can be omitted. Ignored by ConX300.
SubstrateObjectAttributes	Required. See the following.

The host can specify substrate attributes inside the SubstrateObjectAttributes Service Parameter in any combination of upper- and lowercase letters. Only the following Substrate attributes may be specified:

ATTRID	Description
ObjID	Required. SEMI standards specify SubstID. However, ConX300 only accepts ObjID because SubstID is not an attribute of the Substrate Object.
BatchLocID	Can be omitted. Must be omitted if SubstLocID is specified.
LotID	Can be omitted.
MaterialStatus	Can be omitted.
SubstDestination	Can be omitted.
SubstHistory	Can be omitted.
SubstLocID	Can be omitted. Must be omitted if BatchLocID is specified.
SubstPosInBatch	Can be omitted. Must be omitted if SubstLocID is specified.
SubstProcState	Required if SubstState is not specified.
SubstSource	Can be omitted.
SubstState	Required if SubstProcState is not specified.
SubstType	Required.
SubstUsage	Can be omitted.

ObjType may not be specified in the list of attributes for this message.

ObjID will be used as the Substrate ID of the created substrate or to find the Substrate to be updated. It must match the ObjID in the OPSPEC. If SubstLocID or BatchLocID is specified, then any collection events relating to a Substrate Transport State Change or a Substrate/Batch Location State Change will be issued.

S14F20 Generic Service Request Acknowledge

```
S14F20            /* Generic Service Request Ack (GSA) M,H<-E */
   <L[4]
      <U1 SVCACK>
      <U4 LINKID>
      <L[3]
      <L[2]
         <A "ObjectLinkID">
         <U4 0>
      >
      <L[2]
         <A "ObjectActionStatus">
         <U1 SVCACK>
      >
      <L[2]
         <A "ObjectActionParameterResult">
         <L[NumberOfAttributes]
            <L[2]
               <A ATTRID>
               <ATTRDATA>
            >
            ...
            >
         >
      >
      <L[2]
         <U1 SVCACK>
         <L[NumberOfErrors]
            <L[2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...
         >
      >
   > .
```

This message indicates the success or failure of S14F19 Generic Service Request (UpdateSubstrateObject) (on page 7-48).

If no errors were found, `SVCACK = 0` and `NumberOfErrors = 0`.

`ObjectActionStatus` also returns `SVCACK`.

`LINKID` and `ObjectLinkID` will always be `0`.

If the `UpdateSubstrateObject` service request is successful, `NumberOfAttributes` returns a list showing the Attribute IDs and Attribute data from the `SubstrateObjectAttributes` service parameter. Otherwise, `NumberOfAttributes` is `0`.

S16F1 Inquire

```
S16F1 W            /* Multi-Block P-Job Inquire (PRJI) S,H->E */
   <L [2]
      <U4 DATAID>
      <U4 DATALENGTH>
   >.
```

The host may send this message prior to a multi-block message, but this equipment does not require it.

S16F2 Grant

```
S16F2            /* Multi-Block P-Job Grant (PRJG) S,H<-E */
   <B [1] GRANT> .
```

`GRANT = 0x00` indicates that the equipment accepts the S16F1 Inquire (on page 7-51). Any other value indicates that the equipment refuses the Inquire.

This equipment has an infinite Conversation Timeout.

S16F5 Process Job Command Request

```
S16F5 W             /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A PRCMDNAME>
      <L [NumberOfParameters]
         <L [2]
            <A CPNAME>
            <CPVAL>
         >
         ...
      >
   >.
```

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

`PRCMDNAME` specifies the desired Process Job Command. The host can specify this ID in any combination of upper- and lowercase letters. The value must be one of the following:

- `Abort`
- `Cancel`
- `Pause`
- `Resume`
- `Start` (or `StartProcess`)
- `Stop`

Each `CPNAME` and `CPVAL` pair specifies one Command Parameter and must be valid for the specified `PRCMDNAME`. However, none of the standard commands require parameters.

The host may precede this message with the `S16F1/2 Inquire/Grant`.

S16F5 Process Job Command (Abort)

```
S16F5 W             /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A "Abort">                   /* PRCMDNAME */
      <L>                           /* No Parameters */
   >.
```

This command can be used to abort a process job that is in any state except `Aborting`.

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

The host can also specify the `PRCMDNAME` ("`Abort`") in any combination of upper- and lowercase letters.

S16F5 Process Job Command (Cancel)

```
S16F5 W             /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A "Cancel">                  /* PRCMDNAME */
       <L>                          /* No Parameters */
   >.
```

This command can be used to cancel a process job. The job must be in the `QUEUED/POOLED` state (not yet transited to `Active`). The canceled job takes Transition #18 and the Process Job Object is destroyed.

This command is equivalent to S16F17 Process Job Dequeue Request (on page 7-67).

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

The host can also specify the `PRCMDNAME` ("`Cancel`") in any combination of upper and lowercase letters.

S16F5 Process Job Command (Pause)

```
S16F5 W            /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A "Pause">                  /* PRCMDNAME */
      <L>                          /* No Parameters */
   >.
```

This command can be used to pause a Process Job that is in the `EXECUTING` state.

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

The host can also specify the `PRCMDNAME` ("`Pause`") in any combination of upper- and lowercase letters.

S16F5 Process Job Command (Resume)

```
S16F5 W            /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A "Resume">                 /* PRCMDNAME */
      <L>                          /* No Parameters */
   >.
```

This command can be used to resume a Process Job that is in the `PAUSE` state.

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

The host can also specify `PRCMDNAME ("Resume")` in any combination of upper- and lowercase letters.

S16F5 Process Job Command (Start)

```
S16F5 W            /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A "Start">                  /* PRCMDNAME */
      <L>                          /* No Parameters */
   >.
```

This command can be used to start a Process Job that is in the `WAITING FOR START` state.

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

The host can also specify the `PRCMDNAME` ("`Start`") in any combination of upper- and lowercase letters. This equipment also accepts the string "`StartProcess`" as an equivalent, if required by the host.

S16F5 Process Job Command (Stop)

```
S16F5 W            /* Process Job Command (PRJCMDR) M,H->E */
   <L [4]
      <U4 DATAID>
      <A PRJOBID>
      <A "Stop">                   /* PRCMDNAME */
      <L>                          /* No Parameters */
   >.
```

This command can be used to stop a Process Job that is in the `EXECUTING` or `PAUSED` state.

This equipment ignores `DATAID`.

`PRJOBID` specifies the Process Job ID. The host can specify this ID in any combination of upper- and lowercase letters.

The host can also specify the `PRCMDNAME` ("`Stop`") in any combination of upper- and lowercase letters.

S16F6 Process Job Command (Acknowledge)

```
S16F6            /* Process Job Command Acknowledge (PRJCMDA) S,H<-E */
   <L [2]
      <A PRJOBID>
         <L [2]
            <BOOLEAN [1] ACKA>
            <L [NumberOfErrors]
               <L [2]
                  <U2 ERRCODE>
                  <A [1..80] ERRTEXT>
               >
               ...                    /* More Errors */
         >
      >
   >.
```

`PRJOBID` shows the Process Job ID.

If there were no errors, `ACKA = TRUE` (non-zero) and `NumberOfErrors = 0`.

S16F11 Enhanced Process Job Create

```
S16F11 W            /* Enhanced Process Job Create ( ) M,H->E */
   <L [7]
      <U4 DATAID>
      <A [1..80] PRJOBID>
      <B [1] MF>                    /* Material Format */
/* Following PrMtlNameList can have any of 3 structures */
/* ----- To specify Material in Carriers/Slots-- */

      <L [NumberOfCarriers]         /* PrMtlNameList */
         <L [2]
            <A [1..80] CARRIERID>
            <L [NumberOfSlots]
               <U1 SLOTID>
               ...                  /* More SlotIDs */
            >
         >
         ... /* More Carriers */
      >
/* ----- Else, To Specify Material in Substrates------- */

      <L [NumberOfSubstrates]      /* PrMtlNameList */
         <A [1..80] MID>           /* Substrate ID */
         ...                       /* More Substrates */
      >

/* ----- Else, To Specify No Material---------------- */

      <L>                           /* PrMtlNameList */
/* Continue for all PrMtlNameList formats ----------- */

      <L [3]
         <U1 PRRECIPEMETHOD>
         <A RCPSPEC>                /* RecipeSPEC or PPID */
         <L [NumberOfParameters]
            <L [2]
               <A RCPARNM>          /* Recipe Param Name */
               <RCPARVAL>           /* Recipe Param Value */
            >
            ...                     /* More Parameters */
         >
      >
      <BOOLEAN PRPROCESSSTART>      /* False = User Start */
                                    /* True = Auto Start */
      <L [NumberOfEvents]           /* PRPAUSEEVENT */
         <U4 CEID>                  /* Collection Event ID */
         ...
      >
   >.
```

The Host requests the equipment to create a Process Job. If this message is multi-block, it may be preceded by the `S16F1/S16F2 Inquire/Grant` transaction, but this equipment does not require it.

`PRJOBID` specifies the name of the Process Job. It must not be the same as any currently existing `PRJOBID`. It must be composed of ASCII characters from `0x20` through `0x7E`, but must exclude the characters `?`, `*`, `~`, `>`, and `:`. Upper- and lowercase alphabetic characters are considered equivalent.

According to SEMI standards, the host should specify MF (Material Format) as one of the following values:

- <B 0x0D>: Material specified in carriers and slots
- <B 0x0E>: Material specified in substrates

This equipment ignores the MF value specified in the message and examines PrMtlNameList structure to determine whether it specifies carriers and slots, substrates, or no material. The equipment will force the value of the created process job PrMtlType attribute to be consistent.

If PrMtlNameList specifies:	Then PrMtlType will be:
Carriers and slots	<B 0x0D>
Substrates	<B 0x0E>
No material	<B>

PrMtlNameList can take one of three formats:

- Specify material in carriers and slots
- Specify material in substrates
- Specify no material

Material in Carriers and Slots

CARRIERID is the ID of the desired carrier. Upper- and lowercase alphabetic characters are considered equivalent for this attribute.

SLOTID is the slot number within the Carrier, with slot 1 as the bottom-most slot.

Material in Substrates

MID is the substrate ID (wafer ID).Upper- and lowercase alphabetic characters are considered equivalent for this attribute.

No Material

If the Process Job specifies no material, PrMtlNameList is a zero-length list.

This equipment ignores the value of PRRECIPEMETHOD in this message. If any parameters are specified by NumberOfParameters, the equipment will force the value of the created Process Job Attribute PRRECIPEMETHOD to be consistent with NumberOfParameters.

If NumberOfParameters is:	Then PRRECIPEMETHOD will be:
Zero	1 (Recipe only)
Non-zero	2 (Recipe with parameters)

RCPSPEC (Recipe Specifier) is the identifier of the Recipe or Process Program to be used for this Process Job.

RCPARNM (Recipe Parameter Name) specifies the name of one of the possible parameters that can be applied to this Recipe or Process Program. Upper- and lowercase alphabetic characters are considered equivalent for this parameter.

RCPARVAL (Recipe parameter value) specifies the value for the parameter specified by RCPARNM.

PRPROCESSSTART specifies whether the Process Job should start automatically or wait for a User Start (S16F5 Process Job Command (Start) (on page 7-55)) or equivalent local operator command). Values are:

- TRUE = AUTO START
- FALSE = USER START

CEID is the collection Event ID of an event that will cause the Process Job to pause. To resume the job, the host sends S16F5 Process Job Command (Resume) (on page 7-54) or the equipment operator sends an equivalent local command.

S16F12 Enhanced Process Job Create Acknowledge

```
S16F12            /* Enhanced Process Job Create Acknowledge ( ) S,H<-E */
   <L [2]
      <A PRJOBID>
         <L [2]
            <BOOLEAN ACKA>
            <L [NumberOfErrors]
               <L [2]
                  <U2 ERRCODE>
                  <A [1..80] ERRTEXT>
               >
            ...                     /* More Errors */
         >
      >
   >.
```

The equipment acknowledges and reports any errors in S16F11 (on page 7-57).

PRJOBID displays the Process Job ID that has been created.

If there were no errors, ACKA = TRUE (non-zero) and NumberOfErrors = 0.

S16F13 Duplicate Process Job Create

```
S16F13 W            /* Duplicate Process Job Create ( ) M,H->E */
   <L [5]
      <U4 DATAID>
      <L [NumberOfPrJobs]
      <L [3]
         <A PRJOBID>                    /* Process Job ID */
         <B [1] MF>                     /* Material Format */
/* Following PrMtlNameList can have any of 3 structures */
/* ----- To specify Material in Carriers/Slots-- */

         <L [NumberOfCarriers]          /* PrMtlNameList */
            <L [2]
               <A [1..80] CARRIERID>
               <L [NumberOfSlots]
                  <U1 SLOTID>
                  ...                   /* More SlotIDs */
               >
            >
            ...                         /* More Carriers */
         >
/* ----- Else, To Specify Material in Substrates-- */

            <L [NumberOfSubstrates]     /* PrMtlNameList */
               <A [1..80] MID>          /* Substrate ID */
               ...                      /* More Substrates */
            >
/* ----- Else, To Specify No Material----------- */

            <L>                         /* PrMtlNameList */

/* Continue for all PrMtlNameList formats ------------------ */

         >
         ...                            /* More Process Jobs */
      >
      <L [3]
         <U1 PRRECIPEMETHOD>
         <A RCPSPEC>                    /* RecipeID or PPID */
         <L [NumberOfParameters]
            <L [2]
               <A RCPARNM>              /* Recipe Parameter Name */
               <RCPARVAL>               /* Recipe Parameter Value */
            >
            ...                         /* More Parameters */
         >
      >
      <BOOLEAN PRPROCESSSTART>          /* False = User Start */
   <L [NumberOfEvents]                  /* PRPAUSEEVENT */
      <U4 CEID>                         /* Collection Event ID */
   ...
   >
>.
```

The Host requests the equipment to create several Process Jobs that all use the same Recipe, Recipe Parameters, and Process Start Method, but which may specify different Material. If this message is multi-block, it may be preceded by the S16F1/S16F2 Inquire/Grant transaction, but this equipment does not require it.

NumberOfPrJobs specifies how many Process Jobs this message will create.

PRJOBID specifies the name of the Process Job. It must not be the same as any currently existing PRJOBID. It must be composed of ASCII characters from 0x20 through 0x7E, but must exclude the characters ?, *, ~, >, and :. Upper- and lowercase alphabetic characters are considered equivalent.

According to SEMI standards, the host should specify MF (Material Format) as one of the following values:

- <B 0x0D>: Material specified in carriers
- <B 0x0E>: Material specified in substrates

This equipment ignores the MF value specified in the message and examines PrMtlNameList structure to determine whether it specifies carriers and slots, substrates, or no material. The equipment will force the value of the created Process Job PrMtlType attribute to be consistent.

If PrMtlNameList specifies:	Then PrMtlType will be:
Carriers and slots	<B 0x0D>
Substrates	<B 0x0E>
No Material	<B>

PrMtlNameList structure can take one of three formats:

- Specify material in carriers and slots
- Specify material in substrates
- Specify no material

Material in Carriers and Slots

CARRIERID is the ID of the desired Carrier. Upper- and lowercase alphabetic characters are considered equivalent for this attribute.

SLOTID is the slot number within the Carrier, with slot 1 as the bottom-most slot.

Material in Substrates

MID is the Substrate ID (Wafer ID). Upper- and lowercase alphabetic characters are considered equivalent for this attribute.

No Material

If the Process Job specifies no material, PrMtlNameList is a zero-length list.

This equipment ignores the value of PRRECIPEMETHOD in this message. If any parameters are specified by NumberOfParameters, the equipment will force the value of the created Process Job attribute PRRECIPEMETHOD to be consistent with NumberOfParameters.

If NumberOfParameters is:	Then PRRECIPEMETHOD will be:
Zero	1 (Recipe only)
Non-zero	2 (Recipe with parameters)

RCPSPEC (Recipe Specifier) is the ID of the Recipe or Process Program to be used for this Process Job.

RCPARNM (Recipe Parameter Name) specifies the name of one of the possible parameters that can be applied to this Recipe or Process program. Upper- and lowercase alphabetic characters are considered equivalent for this parameter.

RCPARVAL (Recipe Parameter Value) specifies the value for the parameter specified by RCPARNM.

PRPROCESSSTART specifies whether the Process Job should start automatically or wait for a User Start (S16F5 Process Job Command (Start) (on page 7-55) or equivalent local operator command). Values are:

- TRUE = AUTO START
- FALSE = USER START

CEID is the Collection Event ID of an event that will cause the Process Job to pause. To resume the job, the host sends S16F5 Process Job Command (Resume) (on page 7-54) or the equipment operator sends an equivalent local command.

S16F14 Duplicate Process Job Create Acknowledge

```
S16F14            /* Duplicate Process Job Create Acknowledge ( ) S,H<-E */
   <L [2]
      <L [NumberOfPrJobs]
         <A PRJOBID>
         ...                                /* More Process Jobs */
      >
      <L [2]
      <BOOLEAN ACKA>
      <L [NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
      ...                                   /* More Errors */
       >
     >
   >.
```

The equipment acknowledges and reports any errors in S16F13 Duplicate Process Job Create (on page 7-60). `NumberOfPrJobs` displayss the number of Process Jobs that have been created. `PRJOBID` shows the ID of a Process Job that was successfully created.

If there were no errors, `ACKA = TRUE` (non zero) and `NumberOfErrors = 0`.

S16F15 Multiple Process Job Create

```
S16F15 W            /* Multiple Process Job Create ( ) M,H->E */
   <L [2]
      <U4 DATAID>
      <L [NumberOfPrJobs]
         <L [6]
            <A PRJOBID>              /* Process Job ID */
            <B [1] MF>               /* Material Format */
/* Following PrMtlNameList can have any of 3 structures */
/* ----- To specify Material in Carriers/Slots-- */

   <L [NumberOfCarriers]             /* PrMtlNameList */
      <L [2]
         <A [1..80] CARRIERID>
         <L [NumberOfSlots]
            <U1 SLOTID>
            ...                      /* More SlotIDs */
         >
      >
      ...                            /* More Carriers */
   >
/* ----- Else, To Specify Material in Substrates-- */

   <L [NumberOfSubstrates]           /* PrMtlNameList */
      <A [1..80] MID>                /* Substrate ID */
      ...                            /* More Substrates */
   >
/* ----- Else, To Specify No Material----------- */

   <L>                               /* PrMtlNameList */
/* Continue for all PrMtlNameList formats ------------------ */

   <L [3]
      <U1 PRRECIPEMETHOD>
      <A RCPSPEC>                    /* RecipeID or PPID */
      <L [NumberOfParameters]
         <L [2]
         <A RCPARNM>                 /* Parm Name */
         <RCPARVAL>                  /* Parm Value */
      >
      ...                            /* More Parameters */
      >
   >
   <BOOLEAN PRPROCESSSTART>
      <L [NumberOfEvents]            /* PRPAUSEEVENT */
         <U4 CEID>                   /* Collection Event ID */
         ...
      >
      >
      ...                            /* More Process Jobs */
      >
   >.
```

The Host requests the equipment to create several Process Jobs, each of which may use different material, Recipes, Recipe Parameters, and Process Start Methods. If this message is multi-block, it may be preceded by the `S16F1/S16F2 Inquire/Grant` transaction, but this equipment does not require it.

NumberOfPrJobs specifies how many Process Jobs this message will create.

PRJOBID specifies the name of the Process Job. It must not be the same as any currently existing PRJOBID. It must be composed of ASCII characters from 0x20 through 0x7E, but must exclude the characters ?, *, ~, >, and :. Upper- and lowercase alphabetic characters are considered equivalent.

According to SEMI standards, the host should specify MF (Material Format) as one of the following values:

- <B 0x0D>: Material specified in carriers and slots
- <B 0x0E>: Material specified in substrates

This equipment ignores the MF value specified in the message and examines PrMtlNameList structure to determine whether it specifies Carriers and Slots, Substrates, or No Material. The equipment will force the value of the created Process Job PrMtlType attribute to be consistent.

If PrMtlNameList specifies:	Then PrMtlType will be:
Carriers and slots	<B 0x0D>
Substrates	<B 0x0E>
No material	<B>

PrMtlNameList structure can take one of three formats:

- Specify material in carriers and slots
- Specify material in substrates
- Specify no material

Material in Carriers and Slots

CARRIERID is the CarrierID of the desired Carrier. Upper- and lowercase alphabetic characters are considered equivalent for this attribute.

SLOTID is the slot number within the Carrier, with slot 1 as the bottom-most slot.

Material in Substrates

MID is the Substrate ID. Upper- and lowercase alphabetic characters are considered equivalent for this attribute.

No Material

If the Process Job specifies No Material, PrMtlNameList is a zero-length list.

This equipment ignores the value of PRRECIPEMETHOD in this message. If any parameters are specified by NumberOfParameters, the equipment will force the value of the created Process Job attribute PRRECIPEMETHOD to be consistent with NumberOfParameters.

If NumberOfParameters is:	Then PRRECIPEMETHOD will be:

Zero	1 (Recipe only)
Non-zero	2 (Recipe with parameters)

RCPSPEC (Recipe Specifier) is the ID of the Recipe or Process Program to be used for this Process Job.

RCPARNM (Recipe Parameter Name) specifies the name of one of the possible parameters that can be applied to this Recipe or Process Program. Upper- and lowercase alphabetic characters are considered equivalent for this parameter.

RCPARVAL (Recipe Parameter Value) specifies the value for the parameter specified by RCPARNM.

PRPROCESSSTART specifies whether the Process Job should start automatically or wait for a User Start (S16F5 Process Job Command (Start (on page 7-55)) or equivalent local operator command). Values are:

- TRUE = AUTO START
- FALSE = USER START

CEID is the collection Event ID of an event that will cause the Process Job to pause. To resume the job, the host sends S16F5 Process Job Command (Resume) (on page 7-54) or the equipment operator sends an equivalent local command.

S16F16 Multiple Process Job Create Acknowledge

```
S16F16            /* Multiple Process Job Create Acknowledge ( ) S,H<-E */
   <L [2]
      <L [NumberOfPrJobs]
         <A PRJOBID>
         ...                          /* More Process Jobs */
      >
      <L [2]
         <BOOLEAN ACKA>
         <L [NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...                       /* More Errors */
         >
      >
   >.
```

The equipment acknowledges and reports any errors in S16F15 Multiple Process Job Create (on page 7-64).

NumberOfPrJobs shows the number of Process Jobs created.

PRJOBID shows the ID of a Process Job that was created successfully.

If there were no errors, ACKA = TRUE (non-zero) and NumberOfErrors = 0.

S16F17 Process Job Dequeue Request

```
S16F17 W            /* Process Job Dequeue Request S,H->E */
   <L [NumberOfPrJobs]
      <A PRJOBID>
      ...                              /* More Process Jobs */
   >.
```

This message commands the equipment to dequeue one or more Process Jobs. The jobs must be in the `QUEUED/POOLED` state (not yet transitioned to `Active`). Each dequeued job takes Transition #18 and the Process Job Object is destroyed.

`PRJOBID` specifies a Process Job ID to dequeue. Any combination of upper- and lowercase letters may be used.

If `NumberOfPrJobs = 0`, the equipment will dequeue all Process Jobs.

This command is equivalent to the `S16F5 (PrCmdName) = "Cancel"` command.

S16F18 Process Job Dequeue Acknowledge

```
S16F18             /* Process Job Dequeue Acknowledge S,H<-E */
   <L [2]
      <L [NumberOfPrJobs]
         <A PRJOBID>
         ...                          /* More Process Jobs */
      >
      <L [2]
         <BOOLEAN ACKA>
         <L [NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...                       /* More Errors */
         >
      >
   >.
```

The equipment acknowledges and reports any errors in S16F17 Process Job Dequeue Request (on page 7-67).

`NumberOfPrJobs` displays the number of Process Jobs dequeued. The number displayed will be equal to the `NumberOfPrJobs` specified in `S16F7`, minus any for which the dequeue failed.

`PRJOBID` shows the Process Job ID.

If there were no errors, `ACKA = TRUE` (non-zero) and `NumberOfErrors = 0`.

S16F19 Get Process Job List

```
S16F19 W            /* Get Process Job List S,H->E */
```

This message requests the equipment to return a list of Process Jobs which have not yet completed. This refers to process jobs whose PRJobState value is not PROCESS COMPLETED.

S16F20 Process Job List Send

```
S16F20              /* Process Job List Send S,H<-E */
   <L [NumberOfPrJobs]
      L [2]
         <A PRJOBID>
         <U1 PRSTATE>              /* Process Job State */
      >
      ...                          /* More Process Jobs */
   >.
```

NumberOfPrJobs displays the number of Process Jobs.

PRJOBID displays the Process Job ID.

PRSTATE shows the state of the Process Job.

S16F21 Process Job Get Space

```
S16F21 W            /* Process Job Get Space S,H->E */
```

This message requests the equipment to return the number of Process Jobs for which it has space to create.

S16F22 Process Job Space Send

```
S16F22              /* Process Job Space Send S,H<-E */
   <U2 PRJOBSPACE> .
```

PRJOBSPACE displays the amount of Process Job space remaining in the equipment, expressed as the number of additional Process Jobs the equipment can create.

See the Equipment Constant PRMaxJobSpace (on page 4-40).

S16F23 Process Job Set Recipe Variables Request

```
S16F23 W            /* Process Job Set Variables Request S,H->E */
   <L [2]
      <A PRJOBID>
      <L [NumberOfVariables]
         <L [2]
            <A RCPPARNM>
            <RCPPARVAL>
         >
         ...                          /* More Variables */
      >
   >.
```

Restriction: This equipment currently does not support this message. For future planning, future versions of this equipment may support the message in the following fashion.

This message commands the equipment to set or change the Recipe Variable Parameters for a specified Process Job. The values specified in `S16F23` will modify the Process Job Attribute `RecVariableList`.

`PRJOBID` specifies the Process Job ID. Both upper- and lowercase alphabetic characters are considered equivalent.

`RCPARNM` (Recipe Parameter Name) specifies the name of one of the possible parameters which can be applied to this Recipe or Process Program. Both upper- and lowercase alphabetic characters are considered equivalent.

`RCPARVAL` (Recipe Parameter Value) specifies the desired value for the parameter specified by `RCPARNM`.

Changes to the Process Job Recipe Variables are submitted to the Equipment Control Software (ECS) for validation before sending the `S16F24` acknowledgment to the Host. When ConX300 receives the `PRJobSetRecipeVariable` request, the ECS is queried using the `NoteAttrChange` callback function. The ECS return value to this callback determines the `S16F24` reply to the host.

The `NoteAttrChange` callback supplies the Object Type, ID, and Handle, in addition to the following data encoded as an E5-formatted list of the attributes and their values:

```
    <L [1] /* number of attributes */
      <L [2] /* an attribute */
         <A "RecVariableList">
         <L [NumberOfVariables]
            <L [2] /* a variable */
               <A "RCPPARNM_01">
               <RCPPARVAL_01>
            >
            ... /* More variables */
         >
      >
   >
```

After examining the submitted Recipe changes, the ECS returns an `ERR_OK (0)` value to indicate that the parameters have been accepted. Otherwise, the ECS returns any appropriate non-zero error code to indicate that the parameters are not accepted. Only after receiving an `ERR_OK` result will ConX300 save the parameters and send the `S16F24` reply to the host.

S16F24 Process Job Set Recipe Variables Acknowledge

```
S16F24            /* Process Job Set Recipe Variables Ack S,H<-E */
      <L [2]
      <BOOLEAN ACKA>
      <L [NumberOfErrors]
         <L [2]
            <U2 ERRCODE>
            <A [1..80] ERRTEXT>
         >
         ...                        /* More Errors */
      >
   >.
```

The equipment acknowledges and reports any errors in S16F23 Process Job Set Recipe Variables Request (on page 7-69). If there were no errors, `ACKA = TRUE` (non-zero) and `NumberOfErrors = 0`.

S16F25 Process Job Set Start Method Request

```
S16F25 W            /* Process Job Set Start Method Request S,H->E */
   <L [2]
      <L [NumberOfPrJobs]
         <A PRJOBID>
         ...                          /* More Process Jobs */
      >
      <BOOLEAN PRPROCESSSTART>
   >.
```

Restriction: Process Job Start Method must be specified when the Process Job is created. For future planning, future versions of this equipment may support this message in the following way.

This message commands the equipment to change the Start Method (`User` or `Auto Start`) for one or more Process Jobs (attribute `PRPROCESSSTART`).

`PRJOBID` specifies the Process Job ID. Upper- and lowercase alphabetic characters are considered equivalent.

If `NumberOfPrJobs = 0`, this equipment will set the specified `PRPROCESSSTART` method for all Process Jobs. `PRPROCESSSTART` specifies the desired Start Method (`User` or `Auto`).

Values are:

`TRUE = AUTOMATIC START`

`FALSE = USER START`

Changes to the `PRPROCESSSTART` attribute are submitted to the Equipment Control Software (ECS) for validation before sending acknowledgment (`S16F26`) to the host. When ConX300 receives the `PRJobSetStartMethod` request, the ECS is queried using the `NoteAttrChange` callback function. The ECS return value to this callback determines the S16F26 reply to the host.

For each process job, the `NoteAttrChange` callback supplies the Object Type, ID, and Handle, in addition to the following data encoded as an E5-formatted list of the attributes along with their values:

```
<L [1] /* number of attributes */
   <L [2] /* an attribute */
      <A "PRProcessStart">
      <BOOLEAN PRPROCESSSTART> /* TRUE / FALSE */
   >
>
```

After examining the submitted `PRProcessStart`, the ECS returns an `ERR_OK (0)` value to indicate that parameters have been accepted. Otherwise, the ECS returns any applicable non-zero error code to indicate the parameters are not accepted. Only after receiving an `ERR_OK` result will ConX300 save the parameters and send the `S16F26` reply to the host.

S16F26 Process Job Set Start Method Acknowledge

```
S16F26            /* Process Job Set Start Method Acknowledge S,H<-E */
   <L [2]
      <L [NumberOfPrJobs]
         <A PRJOBID>
         ...      /* More Process Jobs */
      >
      <L [2]
         <BOOLEAN ACKA>
         <L [NumberOfErrors]
            <L [2]
               <U2 ERRCODE>
               <A [1..80] ERRTEXT>
            >
            ...   /* More Errors */
         >
      >
   >.
```

The equipment acknowledges and reports any errors in S16F25 Process Job Set Start Method Request (on page 7-71).

`NumberOfPrJobs` shows the number of Process Jobs for which the start method was set.

`PRJOBID` shows the Process Job ID.

If there were no errors, `ACKA = TRUE` (non-zero) and `NumberOfErrors = 0`.

S16F27 Control Job Command Request

This code example is SEMI standard format.

```
S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A [1..80] CTLJOBID>
      <U1 CTLJOBCMD>
      <L [0 or 2]
         <A "Action">
         <U1 CPVAL>
      >
   >.
```

This command is used when the host sends a command to a Control Job.

The host can specify `CTLJOBID` and `CTLJOBCMD` in any combination of upper- and lowercase letters. `CTLJOBCMD` specifies the desired command and must be one of the values specified in the `CTLJOBCMD` table found in this topic.

Some commands require the `Action` parameter. When required, `CPVAL` must be one of the values specified in the `CTLJOBCMD` table.

In addition to the SEMI standard format for this command, this equipment also accepts several nonstandard formats used by nonstandard Host computers and older versions of SEMI standards. The following sections describe various parts of the `S16F27` message whose format can vary. These variations can be used alone or together in an `S16F27` message.

SEMI standards specify that `CTLJOBCMD` should be in U1 format. However, this equipment also accepts `CTLJOBCMD` in ASCII (non-standard). The host can specify the ASCII value in any combination of upper and lowercase letters. For example, this equipment accepts either of the following message formats:

```
S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 1>               /* CTLJOBCMD in U1 */
      <L>
   >.

S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjStart">        /* CTLJOBCMD in ASCII */
      <L>
   >.
```

SEMI standards provide for only one Command Parameter in `S16F27`. However,this equipment also allows a non-standard outer list (`NumberOfParameters`). For example, this equipment accepts either of the following message formats:

```
S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 4>                    /* CTLJOBCMD = CjCancel */
      <L [2]>                   /* One Parameter */
         <A "Action">
         <U1 CPVAL>
      >
   >.

S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 4>                    /* CTLJOBCMD = CjCancel */
      <L [1]>                   /* Non-Standard (NumberOfParameters) */
         <L [2]>                /* One Parameter */
            <A "Action">
            <U1 CPVAL>
         >
      >
   >.
```

SEMI standards specify that the `S16F27 Command Parameter Action CPVAL` format should be U1. However, this equipment also accepts `CPVAL` in ASCII format. The host can specify the ASCII value in any combination of upper- and lowercase letters. For example, this equipment accepts either of the following message formats:

```
S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 4>                    /* CTLJOBCMD = CjCancel */
         <L [2]>                /* One Parameter */
         <A "Action">           /* CP Name */
         <U1 0>                 /* CPVAL U1, 0=SAVEJOBS */
      >
   >.

S16F27 W            /* Control Job Command Request S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 4>                    /* CTLJOBCMD = CjCancel */
      <L [2]>                   /* One Parameter */
         <A "Action">           /* CP Name */
         <U1 "SaveJobs">        /* CPVAL format ASCII */
      >
   >.
```

CTLJOBCMD values

Command request	Standard format*	Nonstandard ASCII format**	Is the **"Action"** parameter allowed?
CjStart	<U1 1>	<A "CjStart">	No
CjPause	<U1 2>	<A "CjPause">	No
CjResume	<U1 3>	<A "CjResume">	No
CjCancel	<U1 4>	<A "CjCancel">	Yes
CjDeselect	<U1 5>	<A "CjDeselect">	No
CjStop	<U1 6>	<A "CjStop">	Yes

Command request	Standard format*	Nonstandard ASCII format**	Is the **"Action"** parameter allowed?
CjAbort	<U1 7>	<A "CjAbort">	Yes
CjHOQ	<U1 8>	<A "CjHOQ">	No

* Current SEMI format to specify control job command.
** For compatibility with certain older Host computers, this equipment accepts this nonstandard ASCII format for <A CTLJOBCMD>.

CPVAL specifies disposition of terminated queued process jobs. See the following table for values.

Process job action	**CPVAL format**	
	<U1>*	<A>**
Save terminated queued Process Jobs	<U1 0>	<A "SaveJobs">
Remove terminated queued Process Jobs	<U1 1>	<A "RemoveJobs">

* Current SEMI format to specify CPVAL.
** For compatibility with certain older Host computers, this equipment accepts this nonstandard ASCII format for <CPVAL>.

S16F27 Control Job Command (CjStart) Example 1

```
S16F27 W            /* CjStart Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 1>                        /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

S16F27 Control Job Command (CjStart) Example 2

```
S16F27 W            /* CjStart Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjStart">                 /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

The equipment accepts this non-standard format command for compatibility with older hosts.

`CjStart` causes the specified job to transit from `WaitingForStart` to `EXECUTING` (Control Job Transition #7). The command is rejected if the specified job is not in the `WaitingForStart` state.

The host can specify `CTLJOBID` and `CTLJOBCMD ("CjStart")` in any combination of upper- and lowercase letters.

S16F27 Control Job Command (CjPause) Example 1

```
S16F27 W            /* CjPause Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1  2>                       /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

S16F27 Control Job Command (CjPause) Example 2

```
S16F27 W            /* CjPause Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjPause">                 /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

The equipment accepts this non-standard format command for compatibility with older Host computers.

`CjPause` causes the specified job to transit from `EXECUTING` to `PAUSED` (Control Job Transition #8). The command is rejected if the specified job is not in the `EXECUTING` state.

The Host can specify `CTLJOBID` and `CTLJOBCMD ("CjPause")` in any combination of upper- and lowercase letters.

S16F27 Control Job Command (CjResume) Example 1

```
S16F27 W            /* CjResume Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1  3>                        /* CTLJOBCMD */
      <L>                            /* No Parameters */
   >.
```

S16F27 Control Job Command (CjResume) Example 2

The equipment accepts this non-standard format command for compatibility with older hosts.

```
S16F27 W            /* CjResume Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjResume">                /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

`CjResume` causes the specified job to transit from `PAUSED` to `EXECUTING` (Control Job Transition #9). The command is rejected if the specified Job is not in the `PAUSED` state.

The host can specify `CTLJOBID` and `CTLJOBCMD ("CjResume")` in any combination of upper- and lowercase letters.

S16F27 Control Job Command (CjCancel) Example 1

```
S16F27 W            /* CjCancel Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 4>            /* CTLJOBCMD */
      <L [2]
         <A "Action">   /* CPNAME */
         <U1 CPVAL>     /* CPVAL */
      >
   >.
```

S16F27 Control Job Command (CjCancel) Example 2

The equipment accepts this non-standard format command for compatibility with older hosts.

```
S16F27 W            /* CjCancel Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjCancel">                /* CTLJOBCMD */
      <L [2]
         <A "Action">               /* CPNAME */
         <U1 CPVAL>                 /* CPVAL */
      >
   >.
```

`CjCancel` causes the specified job to transit from the `QUEUED` state to destroyed (Control Job Transition #2). The command is rejected if the specified job is not in the `QUEUED` state.

The host can specify `CTLJOBID` and `CTLJOBCMD ("CjCancel")` in any combination of upper- and lowercase letters.

The host must specify the `CPNAME` ("`Action`") in any combination of upper- and lowercase letters.

`CPVAL` is format U1. Values are:

- `0 = SAVEJOBS`. Any Process Job object in this Control Job in the `QUEUED` or `POOLED` state is retained. Any other Process Job objects are destroyed.
- `1 = REMOVEJOBS`. All Process Job objects in this Control Job are destroyed.

For additional optional `CjCancel` structures, refer to S16F27 Control Job Command Request (on page 7-75).

S16F27 Control Job Command (CjDeselect) Example 1

```
S16F27 W            /* CjDeselect Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 5>                        /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

S16F27 Control Job Command (CjDeselect) Example 2

```
S16F27 W            /* CjDeselect Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjDeselect">              /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

The equipment accepts this non-standard format command for compatibility with older hosts.

`CjDeselect` causes the specified job to transit from `SELECTED` to `QUEUED` (Head of Queue) state (Control Job Transition #4) and also causes any Job previously at HOQ to transit to `SELECTED` state (Control Job Transition #3).

The host can specify `CTLJOBID` and `CTLJOBCMD ("CjDeselect")` in any combination of upper- and lowercase letters.

S16F27 Control Job Command (CjStop) Example 1

```
S16F27 W            /* CjStop Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 6>                        /* CTLJOBCMD */
      <L [2]
         <A "Action">               /* CPNAME */
         <U1 CPVAL>                 /* CPVAL */
      >
   >.
```

S16F27 Control Job Command (CjStop) Example 2

```
S16F27 W            /* CjStop Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjStop">                  /* CTLJOBCMD */
      <L [2]
         <A "Action">               /* CPNAME */
         <U1 CPVAL>                 /* CPVAL */
      >
   >.
```

The equipment accepts this non-standard format command for compatibility with older hosts.

`CjStop` causes the specified job to transit from the `QUEUED` state to the destroyed state (Control Job Transition #2) or from Active to `COMPLETED` state (Control Job Transition #11). The command is rejected if the specified job is in the `COMPLETED` state.

The host can specify `CTLJOBID` and `CTLJOBCMD ("CjStop")` in any combination of upper- and lowercase letters.

The host must specify the `CPNAME` ("`Action`") in any combination of upper- and lowercase letters.

`CPVAL` is in the U1 format. Values are:

- `0 = SAVEJOBS`. Any Process Job object in this Control Job in the `QUEUED` or `POOLED` state is retained. Any other Process Job objects are destroyed.
- `1 = REMOVEJOBS`. All Process Job objects in this Control Job are destroyed.

For additional optional `CjStop` structures, refer to S16F27 Control Job Command Request (on page 7-75).

S16F27 Control Job Command (CjAbort) Example 1

```
S16F27 W            /* CjAbort Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 7>                        /* CTLJOBCMD */
      <L [2]
         <A "Action">               /* CPNAME */
         <U1 CPVAL>                 /* CPVAL */
      >
   >.
```

S16F27 Control Job Command (CjAbort) Example 2

```
S16F27 W            /* CjAbort Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjAbort">                 /* CTLJOBCMD */
      <L [2]
         <A "Action">               /* CPNAME */
         <U1 CPVAL>                 /* CPVAL */
      >
   >.
```

The equipment accepts this non-standard format command for compatibility with older Hosts.

`CjAbort` causes the specified job to transit from the `QUEUED` to the destroyed state (Control Job Transition #2) or from Active to `COMPLETED` state (Control Job Transition #12). The command is rejected if the specified job is in the `COMPLETED` state.

The host can specify `CTLJOBID` and `CTLJOBCMD ("CjAbort")` in any combination of upper- and lowercase letters.

The host must specify the `CPNAME` ("`Action`") in any combination of upper- and lowercase letters.

`CPVAL` is in the format U1. Values are:

- `0 = SAVEJOBS`. Any Process Job object in this Control Job in the `QUEUED` or `POOLED` state is retained. Any other Process Job objects are destroyed.
- `1 = REMOVEJOBS`. All Process Job objects in this Control Job are destroyed.

For additional optional `CjAbort` structures, refer to S16F27 Control Job Command Request (on page 7-75).

S16F27 Control Job Command (CjHOQ) Example 1

```
S16F27 W            /* CjHOQ Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <U1 8>                        /* CTLJOBCMD */
      <L>                           /* No Parameters */
   >.
```

S16F27 Control Job Command (CjHOQ) Example 2

```
S16F27 W            /* CjHOQ Command S,H->E */
   <L [3]
      <A CTLJOBID>
      <A "CjHOQ">                    /* CTLJOBCMD */
      <L>                            /* No Parameters */
   >.
```

The equipment accepts this non-standard message format for compatibility with older Host computers.

`CjHOQ` causes the specified job to move to Head of Queue. The job must be in the `QUEUED` state. The command is rejected if the specified Job is not in the Queued state. If the specified job is already HOQ, the command is accepted, but no action occurs.

The Host can specify `CTLJOBID` and `CTLJOBCMD ("CjHOQ")` in any combination of upper- and lowercase letters.

S16F28 Control Job Command Acknowledge

NOTE

The following message is in a SEMI standard format.

```
S16F28            /* Control Job Command Acknowledge S,H<-E */
   <L [2]
      <BOOLEAN ACKA>
      <L [0,2]
         <U2 ERRCODE>
         <A [1..80]ERRTEXT>
      >
   > .
```

NOTE

Setting the Equipment Constant `CfgS16F28` to `1` causes the equipment to send the following non-SEMI standard format as required by certain Host computers.

```
S16F28            /* Control Job Command Acknowledge S,H<-E */
   <L [2]
      <BOOLEAN ACKA>
      <L [NumberOfErrors]
      <L [2]
         <U2 ERRCODE>
         <A [1..80] ERRTEXT>
   >
   ...                              /* More Errors */
   >
   >.
```

The equipment acknowledges and reports any errors found in the `S16F27` message.

If there were no errors, `ACKA = TRUE` (non-zero) and `NumberOfErrors = 0`.

S16F29 PrJobSetMaterialOrder

```
S16F29 W            /* PrJobSetMaterialOrder S,H->E */
   <U1 PRMTRLORDER> .
```

NOTE

This equipment currently does not support this message. For future planning, future versions of this equipment may support the message in the following format.

The Host sends a command to the Equipment's Processing Management Service to use the specified order for processing Substrates within their specified Process Job.

`PRMTRLORDER` specifies the desired strategy. The values are:

`1 = ARRIVAL`. Substrates are processed in the order they arrive at the equipment.

`2 = OPTIMIZE`. The equipment chooses the "best" method.

`3 = LIST`. The equipment will process Substrates in the order they are specified in the `PrMtlNameList` attribute.

This message changes the value of the Equipment Constant `PrMtrlOrder`.

S16F30 PrJobSetMaterialOrder Acknowledge

```
S16F30            /* Control Job Command Acknowledge S,H<-E */
   <BOOLEAN ACKA> .
```

The equipment acknowledges success or failure of S16F29 (on page 7-82).

If there were no errors, `ACKA = TRUE` (non-zero).

E30 SECS messages

E30 SECS message summary

Host to Equipment messages

The following Host to Equipment SECS messages are supported by this equipment.

Host primary	Equipment reply	Description
(Any)	SxF0	Offline abort reply
S1F1	S1F2	Are you there request
S1F3	S1F4	Selected equipment status request
S1F11	S1F12	Status Variable namelist request
S1F13	S1F14	Establish communication request
S1F15	S1F16	Request offline
S1F17	S1F18	Request online
S2F13	S2F14	Equipment Constant request
S2F15	S2F16	New Equipment Constant send
S2F17	S2F18	Date and time request
S2F23	S2F24	Trace initialize send
S2F25	S2F26	Loopback diagnostic request
S2F29	S2F30	Equipment Constant namelist request
S2F31	S2F32	Date and time send
S2F33	S2F34	Define report
S2F35	S2F36	Link event report
S2F37	S2F38	Enable and disable event report
S2F39	S2F40	Multi-block inquiry
S2F41	S2F42	Host command send
S2F43	S2F44	Reset spooling stream and functions
S5F3	S5F4	Enable and disable alarm send
S5F5	S5F6	List alarms request
S5F7	S5F8	List enabled alarm request
S6F15	S6F16	Event report request
S6F17	S6F18	Annotated event report request
S6F19	S6F20	Individual report request
S6F21	S6F22	Annotated individual report request
S6F23	S6F24	Request spooled data
S7F1	S7F2	Process program load inquire
S7F3	S7F4	Process program send
S7F5	S7F6	Process program request
S7F17	S7F18	Delete process program send
S7F19	S7F20	Current EPPD request
S10F3	S10F4	Terminal display, single
S10F5	S10F6	Terminal display, multiblock

Equipment to Host messages

The following Equipment to Host SECS messages are supported by this equipment.

Equipment primary	Host reply	Description
(Any)	SxF0	Offline abort reply
S1F1	S1F2	Are you there request
S1F13	S1F14	Establish communications request
S5F1	S5F2	Alarm report send
S6F1	S6F2	Trace data send
S6F5	S6F6	Multi-block data send inquire
S6F11	S6F12	Event report send
S6F13	S6F14	Annotated event report send
S7F1	S7F2	Process program load inquire/grant
S7F3	S7F4	Process program send
S7F5	S7F6	Process program request
S9F1	-	Unrecognized device id
S9F3	-	Unrecognized stream type
S9F5	-	Unrecognized function type
S9F7	-	Illegal data
S9F9	-	Transaction timer timeout
S9F11	-	Data too long
S10F1	S10F2	Terminal request

Stream 1 - Equipment status

This stream provides a means for exchanging information about the status of the equipment, including its Current Mode, depletion of various consumable items, and the status of transfer operations.

S1F0 Abort transaction

S1F0 Abort transaction (S1F0) S, H <-> E

Description: This message is used to abort a transaction when an expected reply is received.
If S1F1 is received by the equipment and the equipment is not operating, a S1F0 will be returned to the host. The return of a function 0 to the host will indicate a possible problem on the equipment. Operator intervention may be required at the system console.

Structure: Header only.

S1F1 Are You There Request

S1F1 Are You There Request (R) S, H <-> E

Description: This message establishes if the equipment is online and may be sent by the host to the equipment at any time. A function 0 response to this message means the communication is inoperative and indicates that the equipment is not currently able to process commands from the SECS link.
The equipment sends this message periodically as a heartbeat to determine if the SECS link is operational. The Equipment Constant GemPollDelay specifies how often to send the heartbeat (0 indicates no heartbeat).
The Equipment Constant GemConfigConnect can be set to cause the equipment to send S1F1 instead of S1F13 for Connect Request.

Structure: Header only.

S1F2 On Line Data

S1F2 On Line Data (D) S, H <-> E

Description: Data signifying that the equipment is alive and communications are operational. The equipment must be in the online mode to respond to this message. If the equipment is not operational, an S1F0 will be returned to the host.
A host return indicates that the host link is active.

Structure:
L,2
1. <MDLN>
2. <SOFTREV>

MDLN: Equipment Model Number, Format: A[6]

SOFTREV: Software Version Number, Format: A[20]

Exception: The host sends a zero-length list to the equipment.

S1F3 Selected Equipment Status Request (SSR)

```
S1F3   Selected Equipment Status Request (SSR)   S, H -> E, reply
```

Description: This message is a request to the equipment to report selected values of its status. The host sends the VIDs.
Only SV (Status Variables) VIDs are used in this message. However, the equipment allows the host to use any VID of type DV, EC, or SV.

Structure:
```
L,n
   1. <SVID1>
   .
   .
   n. <SVIDn>
```

SVID: Status variable ID, Format: U4

Exception: A zero-length list means report all SVIDs.

S1F4 Selected Equipment Status Data (SSD)

```
S1F4   Selected Equipment Status Data (SSD)   S, H <- E
```

Description: The equipment reports the value of each SVID requested in the order requested. The host remembers the names of values.

Structure:
```
L,n
   1. <SV1>
   .
   .
   n. <SVn>
```

SV: Status variable value, Format: Dependent on variable

Exception: If n=0, no response can be made. A zero-length list returned for SVi means that SVIDi does not exist.

S1F11 Status Variable Namelist Request (SVNR)

```
S1F11   Status Variable Namelist Request (SVNR)   S, H->E, reply
```

Description: A request to the equipment to identify certain status variables.

Structure:
```
L,n
   1. <SVID1>
   .
   .
   n. <SVIDn>
```

SVID: Status variable ID, Format: U4

Exception: A list of zero-length means to report the names of all SVIDs.

S1F12 Status Variable Namelist Reply (SVNRR)

S1F12 Status Variable Namelist Reply (SVNRR) M, H<-E

Description: The equipment reports to the host the name and units of the requested SVs.

Structure:

```
L,n
   1. L,3
      1. <SVID1>
      2. <SVNAME1>
      3. <UNITS1>
   2. L,3
   .
   .
   n. L,3
      1. <SVIDn>
      2. <SVNAMEn>
      3. <UNITSn>
```

SVID: Status variable ID, Format: U4

SVNAME Status variable name, Format: A

UNITS Status variable units, Format: A

S1F13 Establish Communications Request (CR)

S1F13 Establish Communications Request (CR) S, H <-> E, reply

Description: The purpose of this message is to initiate communications at a logical application level during power-up and following a break in communications. It should be the first message sent following any period where host and equipment SECS applications are unable to communicate. An attempt to send this message should be repeated at programmable intervals until an Establish Communications Acknowledge (S1F14) is received within the transaction timeout period with an acknowledgment code accepting the establishment.
Either end of the link may send S1F13 as the first message to establish connection of the link.
The Equipment Constant `GemEstabCommDelay` specifies how often for the equipment to attempt to establish communications with the host (`0` indicates never).

Structure:

```
L,2
   1. <MDLN>
   2. <SOFTREV>
```

MDLN: Equipment Model Number, Format: A [6]

SOFTREV: Software Version Number, Format: A [20]

Exception: The host sends a zero-length list to the equipment.

S1F14 Establish Communications Request Acknowledge (CRA)

S1F14 Establish Communications Request Acknowledge (CRA) S, H <-> E

Description: Accept or deny Establish Communications Request (S1F13). MDLN and SOFTREV are online data and are valid only if COMMACK = 0.

Structure:
```
L,2
   1. <COMMACK>
   2. L, 2
      1. <MDLN>
      2. <SOFTREV>
```

COMMACK: Establish Communications Acknowledge Code, Format: B [1]
0 = Accepted.
1 = Denied, try again.

MDLN: Equipment Model Number, Format: A [6]

SOFTREV: Software Version Number, Format: A [20]

Exception: The host sends a zero-length list for item 2 to the equipment.

S1F15 Request OFFLINE (ROFL)

S1F15 Request OFFLINE (ROFL) S, H->E, reply

Description: The host requests that the equipment transition to the OFFLINE state.

Structure: Header only.

S1F16 OFFLINE Acknowledge (OFLA)

S1F16 OFF-LINE Acknowledge (OFLA) S, H<-E

Description: Acknowledge or error.

Structure: <OFLACK>

S1F17 Request ONLINE (RONL)

S1F17 Request ONLINE (RONL) S, H->E, reply

Description: The host requests that the equipment transition to the ONLINE state.

Structure: Header only.

S1F18 ONLINE Acknowledge (ONLA)

```
S1F18   ONLINE Acknowledge (ONLA)   S, H<-E
```

Description: Acknowledge or error.

Structure:
```
<ONLACK>
```

Stream 2 - Equipment control and diagnostics

Stream 2 messages deal with control of the equipment from the host. This includes all remote operations and equipment self-diagnostics and calibration.

S2F0 Abort transaction (S2F0)

```
S2F0   Abort transaction (S2F0)   S, H <- E
```

Description: The same form as S1F0 Abort Transaction (on page 7-85).

S2F13 Equipment Constant Request (ECR)

```
S2F13   Equipment Constant Request (ECR)   S, H->E, reply
```

Description: This message requests the value of one or more Equipment Constants.

Structure:
```
L,n
   1.  <ECID1>
   .
   .
   n.  <ECIDn>
```

ECID: Equipment Constant ID, Format: U4

Exception: A zero-length list means return the values of all Equipment Constants.

S2F14 Equipment Constant Data (ECD)

```
S2F14   Equipment Constant Data (ECD)   M, H<-E
```

Description: Equipment constant values in the order requested.

Structure:

```
L,n
   1.  <ECV1>
   .
   .
   n.  <ECVn>
```

ECV: Equipment Constant value, Format: Dependent on EC data type.

Exception: If n=0, then no response exists. A zero-length ECVi means that ECIDi does not exist.

S2F15 New Equipment Constant Send (ECS)

```
S2F15   New Equipment Constant Send (ECS)   S, H ->E, reply
```

Description: Change one or more Equipment Constants. Several Equipment Constants can be specified if needed.
Only VIDs of type EC can be used in this message.

Structure:

```
L,n
   1.  L,2
            1. <ECID1>
            2. <ECV1>
   2.  L,2
       .

                 .

   n.  L,2
            1. <ECID1>
            2. <ECV1>
```

ECID: Equipment Constant ID, Format: U4

EVC: Equipment Constant value, Format: Dependent on EC data type.

S2F16 New Equipment Constant Acknowledge (ECA)

`S2F16 New Equipment Constant Acknowledge (ECA) S, H <-E`

Description: Acknowledge or error. If EAC contains a non-zero error code, the equipment should not change any of the ECIDs specified in S2F15.

Structure: `<EAC>`

EAC: Equipment acknowledge code, Format: Binary, Length: 1 byte
`0` = Acknowledge.
`1` = Denied, at least one constant does not exist.
`2` = Denied, busy.
`3` = Denied, at least one constant out of range.
`>3` = Other equipment-specific error.

S2F17 Data and Time Request (DTR)

`S2F17 Data and Time Request (DTR) S, H<->E, reply`

Description: Allows the host or equipment to access the date and time from the other end of the link.

Structure: Header only.

S2F18 Data and Time Data (DTD)

`S2F18 Data and Time Data (DTD) S, H<->E`

Description: Returns the time data.

Structure: `<TIME>`

TIME: Time data, Format: A[16] (`TimeFormat=1`) or A[12] (`TimeFormat=0`)

S2F23 Trace Initialize Send (TIS)

```
S2F23   Trace Initialize Send (TIS)   S, H -> E, reply
```

Description: Status variables exist at all times. This function provides a way to sample a subset of those status variables as a function of time. The trace data is returned on S6F1 and is related to the original request by the TRID. Multiple trace requests may be made to that equipment. If the equipment receives a S2F23 with the same TRID as a trace function in progress, the equipment will terminate the old trace and then initiate the new trace. A trace function currently in progress may be terminated by S2F23 with TRID of that trace and `TOTSMP=0`.

Normally, only variables of type SV are used in this message. However, any VID of type DV, EC, or SV can be used.

Structure:

```
L,5
   1.  <TRID>
   2.  <DSPER>
   3.  <TOTSMP>
   4.  <REPGSZ>
   5.  L,n
      1.  <SVID1>
      2.  <SVID2>
      .
      .
      n.  <SVIDn>
```

TRID: Trace request ID, Format: U4

DSPER: Data sample period, Format: A [6] - "hhmmss"

TOTSMP: Total samples to be made, Format: U4

REPGSZ: Reporting group size, Format: U4

SVID: Status variable ID, Format: U4

S2F24 Trace Initialize Acknowledge (TIA)

```
S2F24   Trace Initialize Acknowledge (TIA)   S, H <- E
```

Description: Acknowledge or error.

Structure: `<TIAACK>`

TIAACK: Equipment acknowledgment code, Format: B [1]

`0` = Everything correct.

`1` = Too many SVIDs.

`2` = No more traces allowed.

`3` = Invalid period.

`>3` = Equipment specific error.

S2F25 Loopback Diagnostic Request (LDR)

```
S2F25   Loopback Diagnostic Request (LDR)   S, H<->E, reply
```

Description: A diagnostic message to check out of protocol and communication circuits. The binary string sent is echoed back.

Structure:
```
<ABS>
```

ABS: Any binary string, Format: B

S2F26 Loopback Diagnostic Data (LDD)

```
S2F26   Loopback Diagnostic Data (LDD)   S, H<->E
```

Description: The echoed binary string.

Structure:
```
<ABS>
```

ABS: Any binary string, Format: B

S2F29 Equipment Constant Namelist Request (ECNR)

```
S2F29   Equipment Constant Namelist Request (ECNR)   S, H->E, reply
```

Description: Allows the host to retrieve a list of equipment constant information.

Structure:
```
L,n
   1.  <ECID1>
   .
   .
   n.  <ECIDn>
```

ECID: Equipment Constant ID, Format: U4

Exception: A zero-length list to send information for all ECIDs.

S2F30 Equipment Constant Namelist (ECN)

`S2F30  Equipment Constant Namelist (ECN)  M, H<-E`

Description: Equipment Constant information.

Structure:

```
L,n (number of equipment constants)
   1.  L,6
      1. <ECID1>
      2. <ECNAME1>
      3. <ECMIN1>
      4. <ECMAX1>
      5. <ECDEF1>
      6. <UNITS1>
   2.  L,6
   .
   .
   n.  L,6
      1. <ECIDn>
      2. <ECNAMEn>
      3. <ECMINn>
      4. <ECMAXn>
      5. <ECDEFn>
      6. <UNITSn>
```

ECID: Equipment Constant ID, Format: U4

ECNAME: Equipment Constant name, Format: A

ECMIN: Minimum allowable value for Equipment Constant, Format: Depends on EC

ECMAX: Maximum allowable value for Equipment Constant, Format: Depends on EC

ECDEF: Default value of Equipment Constant, Format: Depends on EC

UNITS: Unit of measure for equipment constant, Format: A

S2F31 Date and Time Send (DTS)

`S2F31  Date and Time Send (DTS)  S, H->E, reply`

Description: Allows the host to set the time on the equipment.

Structure: <TIME>

TIME: Time data, Format: A[16] (`TimeFormat=1`) or A[12] (`TimeFormat=0`)

S2F32 Date and Time Acknowledge (DTA)

S2F32 Date and Time Acknowledge (DTA) S, H<-E

Description: Acknowledges receipt of date and time information.

Structure: <TIACK>

TIACK: Time acknowledge code, Format: B[1]
0 = OK.
1 = Error, not done.
2 to 63 = Reserved.

S2F33 Define Report (DR)

```
S2F33   Define Report (DR)   M, H->E, reply
```

Description: The purpose of this message is for the host to define a group of reports for the equipment.
The Equipment Constant `GemRpType` specifies the report type used for reporting events. A value of `FALSE` means that an Event Report (S6F11) will be sent and a value of `TRUE` means that an Annotated Event Report (S6F13) will be sent.
If S2F33 is multi-block, it must be preceded by the S2F39/S2F40 Inquire/Grant transaction.

Structure:

```
L,2
   1.  <DATAID>
   2.  L,a
      1. L,2
         1. <RPTID1>
         2. L,b
            1.  <VID1>
            .
            .
            b.  <VIDb>
      .
      .
      a.  L,2
         1. <RPTIDa>
         2. L,c
            1.  <VID1>
            .
            .
            c.  <VIDc>
```

DATAID: Data ID, Format: U4

RPTID: Report ID, Format: U4

VID Variable ID, Format: U4

Exceptions: A zero-length list following DATAID deletes all report definitions and associated links.
A zero-length list following RPTID deletes report type RPTID. All CEID links to this RPTID are also deleted.

S2F34 Define Report Acknowledge (DRA)

```
S2F34   Define Report Acknowledge (DRA)   S, H<-E
```

Description: Acknowledge or error. If an error condition is detected the entire message is rejected not allowing partial changes.

Structure:
```
<DRACK>
```

DRACK: Define Report Acknowledge, Format: B [1]
- 0 = Accepted.
- 1 = Denied, insufficient space.
- 2 = Denied, invalid format.
- 3 = Denied, at least one RPTID already defined.
- 4 = Denied, at least one VID does not exist.

S2F35 Link Event Report (LER)

```
S2F35   Link Event Report (LER)   M, H->E, reply
```

Description: The purpose of this message is for the host to link n reports to an event (CEID). These linked event reports will default to DISABLED upon linking. An event would not cause the report to be sent until enabled. If S2F35 is multi-block, it must be preceded by the S2F39/S2F40 Inquire/Grant transaction.

Structure:
```
L,2
   1.  <DATAID>
   2.  L,a
      1. L,2
         1. <CEID1>
         2. L,b
            1.  <RPTID1>
            .
            .
            b.  <RPTIDb>
      .
      .
      a.  L,2
          1. <CEIDa>
          2. L,c
             1.  <RPTID1>
             .
             .
             c.  <RPTIDc>
```

DATAID: Data ID, Format: U4

CEID: Collection Event ID, Format: U4

RPTID: Report ID, Format: U4

Exception: A zero-length list following CEID deletes all report links to that event.

S2F36 Link Event Report Acknowledge (LERA)

S2F36 Link Event Report Acknowledge (LERA) S, H<-E

Description: Acknowledge or error. If an error condition is detected, the entire message is rejected without allowing partial changes.

Structure: <LRACK>

LRACK: Define Report Acknowledge, Format: B [1]
0 = Accepted.
1 = Denied, insufficient space.
2 = Denied, invalid format.
3 = Denied, at least one CEID link already defined.
4 = Denied, at least one CEID does not exist.
5 = Denied, at least one RPTID does not exist.

S2F37 Enable/Disable Event Report (EDER)

S2F37 Enable/Disable Event Report (EDER) S, H->E, reply

Description: The purpose of this message is for the host to enable or disable reporting for a group of events (CEIDs).

Structure:
```
L,2
   1.  <CEED>
   2.  L,n
      1. <CEID1>
      .
      .
      n.  <CEIDn>
```

CEED: Collection Event Enable/Disable Code, Format: BOOLEAN
FALSE = Disable.
TRUE = Enable.

CEID: Collection Event ID, Format: U4

Exception: A zero-length list following CEED means all CEIDs.

S2F38 Enable/Disable Event Report Acknowledge (EDEA)

S2F38 Enable/Disable Event Report Acknowledge (EDEA) S, H<-E

Description: Acknowledge or error. If an error condition is detected the entire message is rejected. Partial changes are not allowed.

Structure: <ERACK>

ERACK: Enable/Disable Event Report Acknowledge, Format: B [1]
0 = Accepted.
1 = Denied, CEID does not exist.

S2F39 Multi-Block Inquire (DMBI)

S2F39 Multi-Block Inquire (DMBI) S, H->E, reply

Description: If an S2F33 or S2F35 message is more than one block, this transaction must precede the message.

Structure: L,2
1. <DATAID>
2. <DATALENGTH>

DATAID: Data ID, Format: U4

DATALENGTH: Data Length, Format: U4

S2F40 Multi-Block Grant (MBG)

S2F40 Multi-Block Grant (MBG) S, H<-E

Description: Acknowledge or error. If an error condition is detected the entire message is rejected. Partial changes are not allowed.

Structure: <GRANT>

GRANT: Grant code, Format: B [1]
0 = Permission granted.
1 = Busy, try again.
2 = No space.
3 = Duplicate name.

S2F41 Host Command Send (HCS)

```
S2F41   Host Command Send (HCS)   S, H -> E, reply
```

Description: The Host requests that the equipment perform the specified remote command with the parameters. There are several types of this message. Valid remote commands can be found in the KIGEM Automation Reference Manual (KIGEM-900-01). The general format is shown below. Commands may be sent in upper or lower case.

Structure:

```
L,2
   1.  <RCMD>
   2.  L, n  (number of parameters)
      1. L,2
         1.  <CPNAME1>
         2.  <CPVAL1>
      .
      .
      n. L,2
         1.  <CPNAMEn>
         2.  <CPVALn>
```

RCMD: Remote command string, Format: A [20]

CPNAME: Command parameter name, Format: A [40]

CPVAL: Command parameter value.

S2F42 Host Command Acknowledge (HCA)

S2F42 Host Command Acknowledge (HCA) S, H <- E

Description: Acknowledge Host command or error. If the command is not accepted due to invalid parameter (such as HCACK = 3), then a list of the invalid parameters will be returned containing the parameter name and reason for being invalid. If there is no invalid parameter then a list of zero-length will be sent for item 2.

Structure:

```
L,2
   1.  <HCACK>
   2.  L, n # of parameters
      1. L,2
         1.  <CPNAME> parameter 1 name
         2.  <CPACK> parameter 1 reason
      .
      .
      n. L,2
         1.  <CPNAME> parameter n name
         2.  <CPACK> parameter n reason
```

HCACK: Host command parameter acknowledge code, Format: B [1]
0 = Acknowledge, command has been performed.
1 = Command does not exist.
2 = Cannot perform now.
3 = At least one parameter is invalid.
4 = Acknowledge, RCMD will be performed with completion signaled later by an event.
5 = Rejected, already in desired condition.
6 = No such object exists.

CPNAME: Command parameter name, Format: A [40]
Same values as S2F41

CPACK: Command parameter acknowledge code, Format: B [1]
61 = Parameter Name (CPNAME) does not exist.
62 = Illegal Value specified for CPVAL.
63 = Illegal Format specified for CPVAL.
64 = No lot ID specified.
65 = No wafer ID specified.

Exception: If there are no invalid parameters, then a list of zero-length will be sent for item 2.

S2F43 Reset Spooling Streams and Functions (RSSF)

```
S2F43   Reset Spooling Streams and Functions (RSSF)   S, H ->E, reply
```

Description: This message allows the host to select specific streams and functions to be spooled whenever spooling is active.

Structure:

```
L,m
   1.  <STRID1>
   2.  L,n
       1.  <FCNID1>
       .
       .
       n.  <FCNIDn>
   .
   .
   m. L,2
       1. <STRID1>
       .
       .
       n.  <FCNIDm>
```

STRID: Stream Identification, Format: U1

FCNID: Function Identification, Format: U1

Exceptions: A zero-length list, m = 0, turns off spooling for all streams and functions. A zero-length list, n = 0, turns on spooling for all functions for the associated stream.

NOTE

Turning off spooling for all functions for a specific stream is achieved by omitting reference to the stream from this message.

Spooling for Stream 1 is not allowed.

Equipment must allow the host to spool all primary messages for a stream.

S2F44 Reset Spooling Acknowledgment (RSA)

```
S2F44   Reset Spooling Acknowledgment (RSA)   M, H <-E
```

Description: Acknowledge or error.

Structure:

```
L,2
   1. <RSACK>          (accept or reject)
   2. L,m              (m = number of streams with
errors)
      1.  <STRID1>
      2.  <STRACK1>    (error in stream)
      3.  L,n          (n = number of functions in
error)
         1. <FCNIDn>
         .
         .
         n. <FCNIDn>
      .
   m.  L,3
      1.  <STRID1>
      2.  <STRACK1>    (error in stream)
      3.  L,n          (n = number of functions in
error)
         1. <FCNIDn>
         .
         .
         n. <FCNIDn>
```

STRID: Stream Identification, Format: U1

FCNID: Function Identification, Format: U1

RSACK: Ready to send Acknowledge code, Format: B [1]
0 = Acknowledge, OK (note that OK is not the same as ready).
1 = Invalid port number.
2 = Requested material is not at identified port.
3 = Busy, try again.
4 = Sender does not have permission to perform this operation.

STRACK: Spool Stream Acknowledge, Format: B [1]
1 = Spooling not allowed for stream (i.e, Stream 1).
2 = Stream unknown.
3 = Unknown function specified for this stream.
4 = Secondary function specified for this stream.

Exceptions: If RSACK = 0, a zero-length list, m = 0, is given, indicating no streams or functions in error.
A zero-length list, n = 0, indicates no functions in error for specified stream.

Stream 5 - Exception reporting

This stream contains messages regarding binary and analog equipment alarms. The alarms are generated by the equipment in response to changing conditions detected by the equipment. Alarms are divided into the following categories:

- Personal safety
- Equipment safety
- Parameter control warning
- Parameter control error
- Irrecoverable error
- Equipment status warning
- Attention flags
- Data integrity.

S5F0 Abort transaction (S5F0)

```
S5F0   Abort transaction (S5F0)   S, H <-> E
```

Description: Same form as S1F0 (on page 7-85).

S5F1 Alarm Report Send (ARS)

`S5F1 Alarm Report Send (ARS) S, H <- E, [reply]`

Description: This message reports a change or presence of an alarm condition. One message will be issued when the alarm is set, and one message will be issued when the alarm is cleared. Irrecoverable errors and attention flags may not have a clear message.
This message is the normal message that the equipment uses to report alarms. In order for this message to be used, the Equipment Constant `ConfigAlarms` must be set to `0`.
The Equipment Constant `WBitS5` controls whether the equipment sends the S5F1 with W-Bit 1 (Reply Expected) or 0 (No Reply Expected).

Structure:
`L,3`
1. `<ALCD>`
2. `<ALID>`
3. `<ALTX>`

ALCD: Alarm code byte, Format: B [1]
Bit 8 = `1` means alarm set.
Bit 8 = `0` means alarm cleared.
Bit 7 = `1` is alarm category code.
`1` = Personal safety.
`2` = Equipment safety.
`3` = Parameter control warning.
`4` = Parameter control error.
`5` = Irrecoverable error.
`6` = Equipment status warning.
`7` = Attention flags.
`8` = Data integrity.
`>8` = Other categories.

ALID: Alarm identification, Format: B [1]

ALTX: Alarm text limited to 40 characters, Format: A [40]

S5F2 Alarm Report Acknowledge (ARA)

`S5F2 Alarm Report Acknowledge (ARA) S, H -> E`

Description: Acknowledge or error.

Structure: `<ACKC5>`

ACKC5: Acknowledge code, Format: B [1]
`0` = Accepted.
`1` = Error, not accepted.

S5F3 Enable/Disable Alarm Send (EAS)

```
S5F3   Enable/disable Alarm Send (EAS)   S, H->E [reply]
```

Description: Allows the host to enable or disable reporting of specified alarms.

Structure:
```
L,2
   1.  <ALED>
   2.  <ALID>
```

ALED: Alarm enable/disable code, Format: B [1]
Bit 8 = 1 means enable alarm.
Bit 8 = 0 means disable alarm.

ALID: Alarm identification, Format: B [1]

Exception: A zero-length item for ALID means all alarms.

S5F4 Enable/Disable Alarm Acknowledge (EAA)

```
S5F4   Enable/Disable Alarm Acknowledge (EAA)   S, H<-E
```

Description: Acknowledge or error.

Structure: <ACK5>

ACK5: Acknowledge code, Format: B [1]
0 = Accepted.
1 = Error, not accepted.

S5F5 List Alarms Request (LAR)

```
S5F5   List Alarms Request (LAR)   S, H->E, reply
```

Description: A request for the equipment to send alarm information to the host.

Structure: <ALID1,…ALIDn>

ALID: Alarm identification, Format: B [1]

Exception: A zero-length item means send all possible alarms regardless of the state of ALED.

S5F6 List Alarms Data (LAD)

S5F6 List Alarms Data (LAD) M, H<-E

Description: Contains the alarm data for the equipment.

Structure:

```
L,n
   1. L,3
      1. <ALCD1>
      2. <ALID1>
      3. <ALTX1>
   2. L,3
   .
   .
   n. L,3
      1. <ALCD1>
      2. <ALID1>
      3. <ALTX1>
```

ALCD: Alarm code byte, Format: B [1]
Bit 8 = 1 means alarm set.
Bit 8 = 0 means alarm cleared.
Bit 7 = 1 is alarm category code.
1 = Personal safety.
2 = Equipment safety.
3 = Parameter control warning.
4 = Parameter control error.
5 = Irrecoverable error.
6 = Equipment status warning.
7 = Attention flags.
8 = Data integrity.
>8 = Other categories.

ALID: Alarm identification, Format: B [1]

ALTX: Alarm text limited to 40 characters, Format: A [40]

S5F7 List Enabled Alarms Request (LEAR)

S5F7 List Enabled Alarms Request (LEAR) S, H->E, reply

Description: List alarms which are enabled.

Structure: Header only.

S5F8 List Enabled Alarms Data (LEAD)

```
S5F8    List Enabled Alarms Data (LEAD)   S, H<-E
```

Description: This message is similar to S5F6 except that it lists only alarms that are enabled.

Structure:

```
L,n
   1. L,3
      1. <ALCD1>
      2. <ALID1>
      3. <ALTX1>
   2. L,3
   .
   .
   n. L,3
      1. <ALCD1>
      2. <ALID1>
      3. <ALTX1>
```

Stream 6 - Data collection

This stream covers in-process measurements and equipment monitoring. Data collection is used to collect data that is associated with the processing of a wafer. At the completion of each site, wafer, or lot, that data is made available by the equipment for the host. Data elements that could be collected and their collection criteria. Data collection may be implemented using event reporting, tracing, or status reports.

S6F0 Abort transaction (S6F0)

```
S6F0   Abort transaction (S6F0)   S, H <-> E
```

Description: Same form as S1F0 Abort Transaction (on page 7-85).

S6F1 Trace Data Send (TDS)

`S6F1 Trace Data Send (TDS) S, H <- E, [reply]`

Description: This function sends samples to the host according to the trace setup done by `S2F23`. Trace is a time-driven form of equipment status.
The variables appear in the same order they were specified in `S2F23`.
The Equipment Constant WBitS6 controls whether the equipment sends `S6F1` with the W-Bit "1" (Reply Expected) or "0" (No Reply Expected).

Structure:

```
L,4
   1.  <TRID>
   2.  <SMPLN>
   3.  <STIME>
   4.  L,n
      1.  <SV1>
      2.  <SV2>
      .
      .
       n.  <SVn>
```

TRID: Trace request ID, Format: U4

SMPLN: Sample number, Format: U4

STIME: Sample time, Format: A [12] (TimeFormat=0) or A [16] (TimeFormat=1)

SV: Status variable value, Format: dependent on variable

Exception: A zero-length STIME means no value is given and that the time will be derived from SMPLN along with knowledge of the request.

S6F2 Trace Data Acknowledge (TDA)

`S6F2 Trace Data Acknowledge (TDA) S, H -> E`

Description: Acknowledge or error.

Structure: `<ACK6>`

ACK6: Acknowledge code, Format: `B [1]`
`0` = Accepted and done.
`>0` = Error, not done.

S6F5 Multi-Block Data Send Inquire (MBI)

S6F5 Multi-block Data Send Inquire (MBI) S, H<-E, reply

Description: If the discrete report S6F11 or S6F13 can involve more than one block, this transaction must precede the transmission.

Structure: L,2
1. <DATAID>
2. <DATALENGTH>

DATAID: Data ID, Format: U4

DATALENGTH: Data Length, Format: U4

S6F6 Multi-Block Grant (MBG)

S6F6 Multi-block Grant (MBG) S, H->E

Description: Grant permission to send.

Structure: <GRANT6>

GRANT6: Permission to send code, Format: B [1]
0 = Permission granted.
1 = Busy, try again.
2 = Not interested.
>2 = Other errors.

S6F11 Event Report Send (ERS)

S6F11 Event Report Send (ERS) S, H <- E, reply

Description: The purpose of this message is for the equipment to send a defined, linked, and enabled group of reports to the host upon the occurrence of an event (CEID). If S6F11 is multi-block, it must be preceded by the S6F5/S6F6 Inquire/Grant transaction. Event reports may be associated with some equipment process state change or some other specific event such as a change in equipment control state or some process parameter being selected. Event reports are used by the host to track equipment process state change. Also, events are used by the host to confirm any asynchronous host/equipment activity, such as setting the process program variables. See event definition section for CEIDs.

This is the "normal" message the equipment uses to report events. In order for this message to be used, the Equipment Constant ConfigEvents must be set to "1".

If S6F11 is multi-block, the equipment first sends the S6F5/S6F6 Inquire/Grant transaction and DATAID in S6F11 will match DATAID in S6F5.

The Equipment Constant WBitS6 controls whether the equipment sends S6F11 with the W-Bit "1" (Reply Expected) or "0" (No Reply Expected).

Structure:

```
L,3
   1.  <DATAID>
   2.  <CEID>
   3.  L,a
      1.  L,2
         1.  <RPTID1>
         2.  L,b
            1.  <V1>
            .
            .
            b.  <Vb>
      .
      .
      a.  L,2
         1.  <RPTIDa>
         2.  L,c
            1.  <V1>
            .
            .
            c.  <Vc>
```

DATAID: Data ID, Format: U4

CEID: Collected Event ID, Format: U4

RPTID: Report ID, Format: U4

V: Variable data, Format: Dependent on variable

Exception: If there are no reports linked to the event a "null' report is assumed. A zero-length list for the number of reports means there are no reports linked to the given CEID.

S6F12 Event Report Acknowledge (ERA)

```
S6F12   Event Report Acknowledge (ERA)   S, H -> E
```

Description: Acknowledge or error.

Structure: `<ACKC6>`

ACKC6: Acknowledge code, Format: `B [1]`
`0` = Accepted and done.
`1` = Error, not done.

S6F13 Annotated Event Report Send (AERS)

```
S6F13   Annotated Event Report Send (AERS)   M, H<-E, reply
```

Description: Similar to `S6F11` except that VIDs are also sent with the data. If the message is multi-block, it must be preceded by the `S6F5/F6 Inquire/Grant` transaction.

Structure:

```
L,3
   1.  <DATAID>
   2.  <CEID>
   3.  L,a
      1.  L,2
         1.  <RPTID1>
         2.  L,b
            1. L,2
               1. <VID1>
               2. <V1>
            .
            .
            b.  L,2
               1. <VIDb>
               2. <Vb>
      .
      .
      a.  L,2
         1.  <RPTIDa>
         2.  L,c
            1. L,2
               1. <VID1>
               2. <V1>
            .
            .
            c.  L,2
               1. <VIDc>
               2. <Vc>
```

DATAID: Data ID, Format: `U4`

CEID: Collected Event ID, Format: `U4`

RPTID: Report ID, Format: `U4`

VID: Variable ID, Format: `U4`

V: Variable data, Format: Dependent on variable

Exception: If there are no reports linked to the event a "null' report is assumed. A zero-length list for the number of reports means there are no reports linked to the given CEID.

S6F14 Annotated Event Report Acknowledge (AERA)

`S6F14 Annotated Event Report Acknowledge (AERA) S, H->E`

Description: Acknowledge or error.

Structure: `<ACKC6>`

ACKC6: Acknowledge code, Format: `B [1]`
`0` = Accepted and done.
`>0` = Error, not done.

S6F15 Event Report Request (ERR)

`S6F15 Event Report Request (ERR) S, H->E, reply`

Description: Allows the host to demand a report group from the equipment. Effectively, this message forces an event report.

Structure: `<CEID>`

CEID Collected Event ID, Format: `U4`

S6F16 Event Report Data (ERD)

S6F16 Event Report Data (ERD) M, H<-E

Description: This message contains the event report.

Structure:

```
L,3
   1.  <DATAID>
   2.  <CEID>
   3.  L,a
      1.  L,2
         1.  <RPTID1>
         2.  L,b
            1.  <V1>
            .
            .
            b.  <Vb>
      .
      .
      a.  L,2
         1.  <RPTIDa>
         2.  L,c
            1.  <V1>
            .
            .
            c.  <Vc>
```

Exception: A zero-length item means there are no reports linked to the given CEID.

S6F17 Annotated Event Report Request (AERR)

S6F17 Annotated Event Report Request (AERR) S, H->E, reply

Description: Allows the host to demand a report group from the equipment. Effectively, this message forces an event report. It is functionally the same as S6F15, except that it requests an annotated event report.

Structure: <CEID>

CEID: Collected Event ID, Format: U4

S6F18 Annotated Event Report Data (AERD)

S6F18 Annotated Event Report Data (AERD) M, H<-E

Description: This message contains the event report.

Structure:

```
L,3
   1.  <DATAID>
   2.  <CEID>
   3.  L,a
      1.  L,2
         1.  <RPTID1>
         2.  L,b
            1. L,2
               1. <VID1>
               2. <V1>
            .
            .
            b.  L,2
               1. <VIDb>
               2. <Vb>
      .
      .
      a.  L,2
         1.  <RPTIDa>
         2.  L,c
            1. L,2
               1. <VID1>
               2. <V1>
            .
            .
            c.  L,2
               1. <VIDc>
               2. <Vc>
```

CEID: A zero-length item means there are no reports linked to the given CEID.

S6F19 Individual Report Request (IRR)

S6F19 Individual Report Request (IRR) S, H->E, reply

Description: This message allows the host to request a defined individual report from the equipment.

Structure: <RPTID>

RPTID: Report ID, Format: U4

S6F20 Individual Report Data (IRD)

```
S6F20   Individual Report Data (IRD)   M, H<-E
```

Description: The equipment sends variable data defined for the RPTID specified in the S6F19 request message.

Structure:

```
L,n
   1.  <V1>
   .
   .
   n.  <Vn>
```

V: Variable data, Format: Dependent on variable

Exception: A zero-length list means RPTID is not defined.

S6F21 Annotated Individual Report Request (AIRR)

```
S6F21   Annotated Individual Report Request (AIRR)   S, H->E, reply
```

Description: The equipment sends variable data defined for the RPTID specified in the `S6F19` request message.

Structure:

```
<RPTID>
```

RPTID: Report ID, Format: `U4`

S6F22 Annotated Individual Report Data (AIRD)

```
S6F22   Annotated Individual Report Data (AIRD)   M, H<-E
```

Description: The equipment sends annotated variable data defined for the RPTID specified in the `S6F21` request message.

Structure:

```
L,n
   1. L,2
      1. <VID1>
      2. <V1>
   .
   .
   n. L,2
      1. <VIDn>
      2. <Vn>
```

VID: Variable ID, Format: `U4`

V: Variable data, Format: Dependent on variable

Exception: A zero-length list means RPTID is not defined.

S6F23 Request Spooled Data (RSD)

`S6F23 Request Spooled Data (RSD) S, H -> E, reply`

Description: The purpose of this message is for the Host to request transmission or deletion of the messages currently spooled by the equipment.
The Equipment Constant `MaxSpoolTrans` specifies how many messages the equipment will send in response to the `S6F23`. A value of zero implies that all messages in the spool will be sent.

Structure: `<RSDC>`

RSDC: Request Spool Data Code, Format: `B [1]`
`0` = Transmit Spooled Messages.
`1` = Purge Spooled Messages.

S6F24 Request Spooled Data Acknowledgment Send (RSDAS)

`S6F24 Request Spooled Data Acknowledgment Send (RSDAS) S, H <- E`

Description: The purpose of this message is to acknowledge the receipt of the `Request Spooled Data (S6F23)` and to respond with an appropriate acknowledge code.

Structure: <RSDA>

RSDA: Request Spool Data Acknowledge, Format: `B [1]`
`0` = OK.
`1` = Denied, busy try later.
`2` = Denied, spooled data does not exist.
`3-63` = Reserved.

Stream 7 - Process program management

The functions in this stream are used to manage and transfer process or test programs.

S7F0 Abort transaction (S7F0)

`S7F0 Abort transaction (S7F0) S, H <-> E`

Description: Same as S1F0 Abort Transaction (on page 7-85).

S7F1 Process Program Load Inquire (PPI)

`S7F1 Process Program Load Inquire (PPI) S, H <-> E, reply`

Description: This message is used to initiate the transfer of a process program or to select from stored programs. The message may be used to initiate the transfer of an unformatted process program (S7F3/4).

Structure:
`L,2`
1. `<PPID>`
2. `<LENGTH>`

PPID: Process Program ID (e.g, "`Gem_Test.cpf`"), Format: `A [80]`
PPID is case-sensitive and shall contain the correct filename extension.

LENGTH: Length of the process program in bytes, Format: `U4`

S7F2 Process Program Load Grant (PPG)

`S7F2 Process Program Load Grant (PPG) S, H <-> E`

Description: This message gives permission for the process program to be loaded.

Structure: `<PPGNT>`

PPGNT: Process Program Grant Status, Format: `B [1]`
`0` = OK.
`1` = Already have.
`2` = No space.
`3` = Invalid PPID.
`4` = Busy, try later (must be in IDLE state).
`5` = Will not accept.

S7F3 Process Program Send (PPS)

`S7F3 Process Program Send (PPS) M, H <-> E, reply`

Description: Send an unformatted Process Program. If S7F3 is multi-block, it must be preceded by the S7F1/2.

Structure:
`L,2`
1. `<PPID>`
2. `<PPBODY>`

PPID: Process Program ID (e.g, "`Gem_Test.cpf`"), Format: `A [80]`
PPID is case-sensitive and shall contain the correct filename extension.

PPBODY: Process Program Body. The process program describes to the equipment, in its own language, the actions to be taken in processing the material it receives.

S7F4 Process Program Acknowledge (PPA)

`S7F4 Process Program Acknowledge (PPA) S, H <-> E`

Description: Acknowledge or error.

Structure: `<ACKC7>`

ACKC7: Acknowledge code, Format: `B [1]`
`0` = Accepted.
`1` = Permission not granted.
`2` = Length error.
`3` = Matrix overflow.
`4` = PPID not found.
`5` = Mode unsupported.
`>5` = Other error.

S7F5 Process Program Request (PPR)

`S7F5 Process Program Request (PPR) S, H <-> E, reply`

Description: This message is used to request the transfer of a process program.

Structure: `<PPID>`

PPID: Process Program ID (e.g, "`Gem_Test.cpf`"), Format: `A [80]`
PPID is case-sensitive and shall contain the correct filename extension.

S7F6 Process Program Data (PPD)

`S7F6 Process Program Data (PPD) M, H <-> E`

Description: This message is used to transfer a process program. The equipment to host transfer of the process program provides the mechanism for the host computer to receive process programs created on the equipment. This allows use of the equipment without having process program generation capabilities on the host.

Structure:
`L,2`
1. `<PPID>`
2. `<PPBODY>`

PPID: Process Program ID (e.g, "`Gem_Test.cpf`"), Format: `A [80]`
PPID is case-sensitive and shall contain the correct filename extension.

PPBODY: Process Program Body. The process program describes to the equipment, in its own language, the actions to be taken in processing the material it receives.

Exception: A zero-length list means request denied.

S7F17 Delete Process Program Send (DPS)

S7F17 Delete Process Program Send (DPS) S, H -> E, reply

Description: This message is used by the host to request the equipment to delete process programs from the equipment storage.

Structure: L,n (Number of process programs to be deleted)

1. <PPID1>
.
.
n. <PPIDn>

PPID: Process Program ID (e.g, "Gem_Test.cpf"), Format: A [80]
PPID is case-sensitive and shall contain the correct filename extension.

Exception: If n = 0, then delete all.

S7F18 Delete Process Program Acknowledge (DPA)

S7F18 Delete Process Program Acknowledge (DPA) S, H <- E

Description: Acknowledge or error.

Structure: <ACKC7>

ACKC7: Acknowledge code, Format: B [1]
0 = Accepted.
1 = Permission not granted.
2 = Length error.
3 = Matrix overflow.
4 = PPID not found.
5 = Mode unsupported.
>5 = Other error.

S7F19 Current EPPD Request (RER)

S7F19 Current EPPD Request (RER) S, H -> E, reply

Description: The host requests that the equipment transmit the current equipment process program directory (EPPD). This is a list of all the PPIDs of the process programs stored on the equipment.

Structure: Header only.

S7F20 Current EPPD Data (RED)

`S7F20 Current EPPD Data (RED) M, H <- E`

Description: Contains the current equipment process program directory (EPPD).

Structure: `L,n` (Number of process programs in the directory)

```
1. <PPID1>
.
.
n. <PPIDn>
```

PPID: Process Program ID (e.g, "`Gem_Test.cpf`"), Format: `A [80]`

Stream 9 - System errors

This stream provides a method for informing the host that a message block has been received which cannot be handled or that a timeout on a transaction timer has occurred. The messages indicate that either a Message Fault or a Communications Fault has occurred, but do not indicate that a Communications Failure has occurred.

S9F1 Unrecognized Device ID (UDN)

`S9F1 Unrecognized Device ID (UDN) S, H <- E`

Description: The device ID in the message block header did not correspond to any known device ID in the mode detecting the error.

Structure: `<MHEAD>`

MHEAD: SECS message block header associated with message block in error, Format: `B [10]`

S9F3 Unrecognized Stream Type (USN)

`S9F3 Unrecognized Stream Type (USN) S, H <- E`

Description: The equipment does not recognize the stream type in the message block header.

Structure: `<MHEAD>`

MHEAD: SECS message block header associated with message block in error, Format: `B [10]`

S9F5 Unrecognized Function ID (UFN)

S9F5 Unrecognized Function ID (UFN) S, H <- E

Description: This message indicates that the function in the message ID is not recognized by the receiver.

Structure: <MHEAD>

MHEAD: SECS message block header associated with message block in error, Format: B [10]

S9F7 Illegal Data (IDN)

S9F7 Illegal Data (IDN) S, H <- E

Description: This message indicates that the stream and function were recognized, but the associated data format could not be interpreted.

Structure: <MHEAD>

MHEAD: SECS message block header associated with message block in error, Format: B [10]

S9F9 Transaction Timer Timeout (TTN)

S9F9 Transaction Timer Timeout (TTN) S, H <- E

Description: This message indicates that a transaction (receive) timer has timed out and that the corresponding transaction has been aborted. It is up to the host to respond to this error in an appropriate manner to keep the system operational.

Structure: <SHEAD>

SHEAD: Stores header related to the transaction timer, Format: B [10]

S9F11 Data Too Long (DLN)

S9F11 Data Too Long (DLN) S, H <- E

Description: This message to the host indicates that the equipment has been sent more data than it can handle.

Structure: <MHEAD>

MHEAD: SECS message block header associated with message block in error, Format: B [10]

Stream 10 - Terminal services

This stream is used to pass textual messages between the operator control console located at the equipment and the host. The equipment does not interpret the message text. The text is passed on to the terminal.

S10F3 Terminal Display, Single (VTN)

`S10F3  Terminal Display, Single (VTN)  S, H -> E, [reply]`

Description: Allows a terminal text message to be sent from the host to the equipment.

Structure:
```
L,2
   1. <TID>
   2. <TEXT>
```

TID: Terminal number, Format: `B [1]`
`0` = Single or main terminal.
`>0` = Additional terminals at the same equipment (NOT supported).

TEXT: A single line of characters. Format: `ASCII`

S10F4 Terminal Display, Single Acknowledge (VTA)

`S10F4  Terminal Display, Single Acknowledge (VTA)  S, H <- E`

Description: Acknowledge or error.

Structure: `<ACKC10>`

ACKC10: Acknowledge code, Format: `B [1]`
`0` = Accepted for display.
`1` = Message will not be displayed.
`2` = Terminal not available.

S10F5 Terminal Display, Multi-Block (VMN)

`S10F5  Terminal Display, Multi-Block (VMN)  S, H -> E, [reply]`

Description: Allows a multi-block terminal text message to be sent from the host to the equipment.

Structure:

```
L,2
   1. <TID>
   2. L,n
      1. <TEXT>
      .
      .
      n. <TEXT>
```

TID: Terminal number, Format: `B [1]`
`0` = Single or main terminal.
`>0` = Additional terminals at the same equipment (NOT supported).

TEXT: A single line of characters. Format: `ASCII`

S10F6 Terminal Display, Multi-Block Acknowledge (VMA)

`S10F6  Terminal Display, Multi-block Acknowledge (VMA)  S, H <- E`

Description: Acknowledge or error.

Structure: `<ACKC10>`

ACKC10: Acknowledge code, Format: `B [1]`
`0` = Accepted for display.
`1` = Message will not be displayed.
`2` = Terminal not available.

E30 SECS message scenarios

The following scenarios show information that is sent to and from the equipment and the Host. In these scenarios, tables are used to show the process that the information is sent and shared. When a **<--** or **-->** symbol is used, it functions as a directional arrow to show which direction the information is being sent.

For example, the following table shows the first steps in a scenario. In step 2, the equipment is sending a S1F13 message to the Host. This is represented by the **<--** preceding the message to show that the message is being sent to the Host.

Step	Host	Equipment	Description
1	-	-	The equipment communication state is `NOT COMMUNICATING`.
2	-	<-- S1F13	Equipment sends an Establish Communications Request.

Establish communications

The following scenarios show the processes for establishing communications.

Host attempts to establish communications

Step	Host	Equipment	Description
1	-	-	The equipment communication state is `ENABLED`.
2	S1F13 -->	-	The Host sends an Establish Communications Request.
3	-	<-- S1F14	The equipment responds with an Establish Communications Acknowledge, with `COMMACK = Accept (0)`.
4	-	-	Communications are established.

Equipment attempts to establish communications

Step	Host	Equipment	Description
1	-	-	The equipment Communication State is `NOT COMMUNICATING`.
2	-	<-- S1F13	The equipment sends an Establish Communications Request.
3	S1F14 -->	-	The Host sends and Establish Communications Acknowledge.
4	-	-	If S1F14 is received without a time out, then go to step 7.
5	-	-	Wait for `EstablishCommunicationsTimeout` period.
6	-	-	Go to step 2.
7	-	-	If `COMMACK = Accept (0)`, then go to step 10.
8	-	-	Wait for `EstablishCommunicationsTimeout` period.
9	-	-	Go to step 2.
10	-	-	Communications are established.

Simultaneous attempt to establish communications, case 1

The equipment receives S1F14 from the Host before sending S1F14.

Step	Host	Equipment	Description
1	-	-	The equipment communication state is `NOT COMMUNICATING`.
2	-	<-- S1F13	The equipment sends an Establish Communications Request.
3	S1F13 -->	-	The Host sends an Establish Communications Request.
3	S1F14 -->	-	The Host sends an Establish Communications Acknowledge with `COMMACK = Accept (0).`
4	-	-	At this point, communications are established.
5	-	<-- S1F14	The equipment sends S1F14 with `COMMACK = Accept(0).`

Simultaneous attempt to establish communications, case 2

The equipment sends S1F14 to the Host before receiving S1F14.

Step	Host	Equipment	Description
1	-	-	The equipment communication state is `NOT COMMUNICATING`.
2	-	<-- S1F13	The equipment sends an Establish Communications Request.
3	S1F13 -->	-	The Host sends an Establish Communications Request.
4	-	<-- S1F14	The equipment sends S1F14 with `COMMACK = Accept (0).`
4	-	-	At this point, communications are established.
5	S1F14 -->	-	The host sends an Establish Communications Acknowledge with `COMMACK = Accept(0).`

Heartbeat

Step	Host	Equipment	Description
1	-	<-- S1F1	The equipment sends an Are You There message periodically to determine if the SECS link is still intact.
2	S1F2 -->	-	The Host replies with an Online Data message. The equipment knows that the link is still intact.

Event data collection

The following scenarios show the processes for collecting event data.

Equipment reports event

Step	Host	Equipment	Description
1	-	-	The equipment recognizes that an event has occurred. The Host has enabled reporting for the CEID and has possibly defined one or more reports and linked them to the CEID. The Equipment Constant `RpType` is set to `FALSE` to request normal reports.
2		-	If event report is a single block, go to step 5.
3	-	<-- S6F5	Inquire. If the event report is multi-block, the equipment first sends this multi-block inquiry for permission.
4	S6F6 -->	-	Grant. The Host grants permission to send a multi-block event report. If `GRANT` is non- zero, this scenario fails here and the event data is discarded.
5	-	<-- S6F11	The equipment sends event reports for the CEID.
6	S6F12 -->	-	The Host acknowledges the report.

Host requests event report

Step	Host	Equipment	Description
1	S6F15 -->	-	The Host requests an event report group by specifying the CEID.
2	-	<-- S6F16	The equipment sends any reports linked to the requested collection event.

Dynamic event configuration

The following scenario shows the process for configuring a dynamic event.

Collection event reporting set-up

Step	Host	Equipment	Description
1	-	-	If the define report message is a single block, go to step 4.
2	S2F39 -->	-	Inquire. If the define report is multi-block, the Host sends this multi-block inquiry for permission.
3	-	<-- S2F40	Grant. The equipment grants permission to send a multi-block report definition. If `GRANT` is non-zero, this scenario fails here.
4	S2F33 -->	-	Define report. The Host sends report definitions.
5	-	<-- S2F34	The equipment acknowledges. If the reports are accepted, `DRACK=0`.
6	-	-	If the link event report message is a single block, go to step 9.
7	S2F39 -->	-	Inquire. If the link event report is multi-block, the Host first sends this multi-block inquiry for permission.
8	-	<-- S2F40	Grant. The equipment grants permission to send a multi-block link event report. If `GRANT` is non-zero, this scenario fails here.
9	S2F35 -->	-	Link Events/Reports. The Host links reports to the necessary collection events. Linked reports are initially disabled.
10	-	<-- S2F36	The equipment acknowledges. If `LRACK` is `0`, the Event/Report linkages are acceptable.
11	S2F37 -->	-	Enable Event Reports. The Host enables reporting for the necessary collection events.
12	-	<-- S2F38	Equipment acknowledges. If `ERACK` is `0`, the equipment will report events as they occur.

Variable data collection

The following scenario shows the process for collecting variable data.

Host requests report

Step	Host	Equipment	Description
1	S6F19 -->	-	The Host requests an individual event report.
2	-	<-- S6F20	The equipment sends the requested event report.

Trace data collection

The following scenario shows the process for collecting trace data

Host initiates trace report

Step	Host	Equipment	Description
1	S2F23 -->	-	The Host initiates a trace.
2	-	<-- S2F24	The equipment acknowledges the trace request. If the data in S2F23 is not valid, `TIAACK <> 0` and the scenario ends. Otherwise, the following are done "`TOTSMP`" times, where `TOTSMP` is the total number of samples to be done.
3	-	-	Collect data.
4	-	-	Wait `DSPER`.
5	-	-	If number of samples < `REPGSZ`, go to step 3.
6	-	<-- S6F1	The equipment sends the trace data.
7	S6F2 -->	-	If the S6F1 has its W-Bit set to `1`, the Host acknowledges the trace data.
8	-	-	If number of samples sent < `TOTSMP`, go to step 3.
9	S2F23 -->	-	Optional The Host requests trace termination prior to completion by initiating a trace with the same trace ID as the running trace and with `TOTSMP` set to `0`.
10	-	<-- S2F24	The equipment acknowledges the trace request. If the data in S2F23 is valid, the equipment terminates the trace. If the equipment has saved trace data that has not yet been sent to the Host, it discards the saved data.

Status data collection

The following scenarios show the processes for collecting status data.

Host requests status report

Step	Host	Equipment	Description
1	S1F3 -->	-	The Host requests the VIDs of interest.
2	-	<-- S1F4	Equipment responds with the requested Status Variable values.

Request Equipment Status Variable namelist

Step	Host	Equipment	Description
1	S1F11 -->	-	The Host requests that the equipment identify the specified Status Variables.
2	-	<-- S1F12	The equipment responds with the requested Status Variable data.

Online identification

The following scenario shows the process for online identification.

Host initiated

Step	Host	Equipment	Description
1	S1F1 -->	-	Host sends an Are You There message.
2	-	<-- S1F2	Equipment replies with its `MDLN` and `SOFTREV`.

Alarm management

The following scenarios show the processes for managing alarms.

Enable or disable alarms

Step	Host	Equipment	Description
1	S5F3 -->	-	The Host requests that the specified alarm be enabled or disabled.
2	-	<-- S5F4	Equipment acknowledges with `ACKC5` set to `0` if the request was accepted, `>0` if request was denied.

Upload alarm information

Step	Host	Equipment	Description
1	S5F5 -->	-	The Host requests the data and text for the specified alarms.
2	-	<-- S5F6	The equipment responds with the requested alarm data.

Equipment reports alarm

Step	Host	Equipment	Description
1	-	-	The equipment recognizes that an alarm has occurred. If reporting for this alarm ID is disabled, this scenario ends here.
2	-	<-- S5F1	Send the alarm report. The Equipment Constant `WBitS5` determines whether the W-bit is `0` or `1` in this message.
3	S5F2 -->	-	If the W-bit in S5F1 is `1`, the host acknowledges the alarm report. Otherwise, skip this step.
4	-	<-- S6F11	If an event report is enabled for this alarm, the equipment sends it.
5	S6F12 -->	-	The host acknowledges the event report.

Remote control

The specific scenarios for remote commands are dependent on which commands are issued.

Step	Host	Equipment	Description
1	S2F41 -->	-	The host sends the command.
2	-	<-- S2F42	The equipment acknowledges the command with one of the following HCACK codes: `0` = Command was completed. `1` = Bad command. `2` = Command cannot be executed at this time. `3` = Bad parameter. `4` = Command accepted, but not yet completed.
3	-	<-- S6F11	Equipment sends event reports for the CEID associated with the remote command. This is dependent on the command issued.
4	S6F12 -->	-	Host acknowledges the report.

Equipment Constants

The following scenarios show the processes for sending and receiving Equipment Constants.

Host sends Equipment Constants

Step	Host	Equipment	Description
1	S2F15 -->	-	The Host requests to change the values of one or more Equipment Constants.
2	-	<-- S2F16	The equipment acknowledges. If EAC is `0`, the ECs have been modified successfully.

Host Equipment Constants request

Step	Host	Equipment	Description
1	S2F13 -->	-	The Host requests the value of one or more Equipment Constants.
2	-	<-- S2F14	The equipment sends the values of the requested constants.

Host Equipment Constants namelist request

Step	Host	Equipment	Description
1	S2F29 -->	-	The Host requests information about the specified Equipment Constants (such as the name, min, max, default, and units).
2	-	<-- S2F30	The equipment sends the requested data.

Process program management

The following scenarios show the processes for managing process programs.

Process program creation, editing, or deletion

Step	Host	Equipment	Description
1	-	-	The operator creates, edits, or deletes a process program from the equipment.
2	-	-	`PPChangeName` = `PPID` `PPChangeStatus` = `1` if created `PPChangeStatus` = `2` if edited (currently not supported) `PPChangeStatus` = `3` if deleted
3	S7F19 -->	-	The Host requests a list of process programs available in the equipment.
4	-	<-- S6F11	If `GemPPChangeEvent` is enabled, the equipment notifies the Host of any actions.
5	S6F12 -->	-	The Host acknowledges the events.
6	-	<-- S7F20	The equipment sends the list of available process programs.

Process program deletion by the Host

Step	Host	Equipment	Description
1	S7F17 -->	-	The Host requests the deletion of a process program.
2	-	<-- S7F18	The equipment acknowledges or reports an error.

Process program directory request

Step	Host	Equipment	Description
1	S7F19 -->	-	The Host requests a list of process programs available in the equipment.
2	-	<-- S7F20	The equipment sends the requested data.

Unformatted, host-initiated download

Step	Host	Equipment	Description
1	-	-	If the process program is a single block, go to step 4.
2	S7F1 -->	-	The Host requests permission to send a multi-block process program to the equipment.
3	-	<-- S7F2	The equipment grants or denies permission for the Host to send the process program. If the value of the grant code is non-zero, permission is denied and this scenario ends here.
4	S7F3 -->	-	The Host sends the process program to the equipment.
5	-	-	The equipment validates the process program.
6	-	<-- S7F4	The equipment acknowledges receipt of the process program. If the process program is valid the acknowledge code is `0`. If the process program is not valid or could not be stored in the library, the acknowledge code in this message is non-zero.
7	-	<-- S6F11	If the process program was invalid, the equipment generates a `GemBadDownloadEvent` if it is enabled.
8	S6F12 -->	-	The Host acknowledges the event.

Unformatted, host-initiated upload

Step	Host	Equipment	Description
1	S7F5 -->	-	The Host requests a Process Program from the Equipment Library.
2	-	<-- S7F6	The equipment sends the Process Program. If the Process Program does not exist, the data portion of this message is an empty list.

Equipment terminal services

The following scenarios show the processes for sending information to the equipment for terminal services.

Host sends information to the equipment's display device

Step	Host	Equipment	Description
1	S10F3 -->	-	The Host sends textual information to the equipment terminal.
2	-	<-- S10F4	The equipment acknowledges receipt of the text. Note that this only acknowledges that the text was received, not that the operator has seen it yet.
3	-	-	The operator acknowledges the text by selecting Acknowledge in KIDS.
4	-	<-- S6F11	The equipment sends a `S10Ack` event.
5	S6F12 -->	-	Host acknowledges the `S10Ack` event.

Host sends second message before first message acknowledged

Step	Host	Equipment	Description
1	S10F3 -->	-	The Host sends textual information to the equipment terminal.
2	-	<-- S10F4	The equipment acknowledges receipt of the text. Note that this only acknowledges that the text was received, not that the operator has seen it yet.
3	S10F3 -->	-	The Host sends more textual information to the equipment.
4	-	-	A new message replaces the the old message on the equipment display.
5	-	-	The operator acknowledges the text by selecting Acknowledge in KIDS.
6	-	<-- S6F11	The equipment sends a `S10Ack` event.
7	S6F12 -->	-	The Host acknowledges the `S10Ack` event.

Host sends multi-block text message to equipment

Step	Host	Equipment	Description
1	S10F5 -->	-	The Host sends multiple blocks of textual information to the equipment terminal.
2	-	<-- S10F6	The equipment acknowledges receipt of the text. Note that this only acknowledges that the text was received, not that the operator has seen it yet.
3	-	-	The operator acknowledges the text by selecting Acknowledge in KIDS.
4	-	<-- S6F11	The equipment sends a `S10Ack` event.
5	S6F12 -->	-	Host acknowledges the `S10Ack` event.

Error messages

The following scenarios show the processes for working with error messages.

Unrecognized device ID

Step	Host	Equipment	Description
1	SxFy -->	-	The Host sends a message with a bad Device ID in the header.
2	-	<-- S9F1	The equipment replies with an Unrecognized Device ID message.

Unrecognized stream

Step	Host	Equipment	Description
1	SxFy -->	-	The Host sends a primary message with a stream number that the equipment does not support.
2	-	<-- S9F3	The equipment replies with an Unrecognized Stream message.

Unrecognized function

Step	Host	Equipment	Description
1	SxFy -->	-	The Host sends a primary message with a stream number that the equipment supports, but with a function number that the equipment does not support for that stream.
2	-	<-- S9F5	The equipment replies with an Unrecognized Function message.

Illegal data format

Step	Host	Equipment	Description
1	SxFy -->	-	The Host sends a message with a stream and function that the equipment recognizes, but with a data format that is incorrect.
2	-	<-- S9F7	The equipment replies with an Illegal Data Format message.

Transaction timer timeout

Step	Host	Equipment	Description
1	-	-	The equipment does not receive an expected reply message from the Host and a transaction timeout occurs.
2	-	<-- S9F9	The equipment sends a Transaction Timer Timeout message.

Data too long

Step	Host	Equipment	Description
1	SxFy -->	-	The Host sends a message with a stream and function that the equipment recognizes, but contains more data than expected.
2	-	<-- S9F11	The equipment replies with a Data Too Long message. If the erroneous message is a primary message with the W-bit set to `1`, then, in some cases, the equipment will reply with a secondary response with an appropriate error code, instead of S9F11. If the erroneous message is secondary, the equipment makes no reply at all.

Clock

The following scenarios show the processes for configuring the date and time.

Host sets date and time

Step	Host	Equipment	Description
1	S2F31 -->	-	The Host instructs the equipment to set date and time to the specified value.
2	-	<-- S2F32	The equipment sets the internal time and acknowledges the request.

Host requests date and time

Step	Host	Equipment	Description
1	S2F17 -->	-	The Host requests the current date and time from the equipment.
2	-	<-- S2F18	The equipment sends the current date and time.

Spooling

The following scenarios show the processes for working with spooled data.

Configure spooling

Step	Host	Equipment	Description
1	S2F15 -->	-	Equipment Constant send. ■ The Host sends the value for the Equipment Constant `ConfigSpool` to indicate whether to enable spooling (`0`) or disable (`1`) spooling. ■ The Host sends the value for the Equipment Constant `MaxSpoolTransmit` to indicate how many messages to de-spool each time the Host sends the S6F23 message (a value of `0` indicates to send all spooled messages). ■ The Host sends the value for the Equipment Constant `OverwriteSpool` to indicate whether to overwrite old messages (`TRUE`) or not (`FALSE`) when the spool fills up.
2	-	<-- S2F16	The equipment acknowledges. If EAC is `0`, the EC has been modified successfully.
3	S2F43 -->	-	Define the messages to be spooled. The Host specifies the streams and functions to be spooled in case of communications failure.
4	-	<-- S2F44	The equipment acknowledges the setup.

Request or delete spooled data

Step	Host	Equipment	Description
1	-	-	Communications between the Host and equipment fails.
2	-	-	Communications between the Host and equipment are restored.
3	S1F3 -->	-	The Host requests variable data that includes spool related Status Variables. The Spool Variables are: ■ SpoolCountActual ■ SpoolCountTotal ■ SpoolFullTime ■ SpoolStartTime
4	-	<-- S1F4	The equipment sends the status data.
5	S6F23 -->	-	The Host sends a request for spooled data or to delete spooled data. If RSDC is set to 0, the spool data is requested. If RSDC is set to 1, the spool data is discarded.
6	-	<-- S6F24	The equipment sends a request for a spooled data acknowledgment. If RSDC is set to 1, then the spool data is discarded. Go to step 10.
7	-	<-- SxFy	If RSDC is set to 0, then the appropriate Streams and Functions are used to transmit the spooled data to the Host. If MaxSpoolTransmit is 0, then go to step 10. If MaxSpoolTransmit is non-zero, the oldest messages of MaxSpoolTransmit are transmitted to the Host. Spooling remains active.
8	-	-	If the spool is empty. Go to step 10.
9	S6F23 -->	-	The Host recognizes that MaxSpoolTransmit is reached. The Host sends a request for additional spooled data (RSDC = 0). Go to step 6.
10	-	<-- S6F11	The equipment sends a Spooling Deactivated event report (GemSpoolingDeactivated). Event reports are sent as appropriate.
11	S6F12 -->	-	The Host acknowledges the report.

Control

The following scenarios show the processes for changing the Control state.

Host accepts ON-LINE

Step	Host	Equipment	Description
1	-	-	The operator selects Go Online when the equipment OFF-LINE state is active.
2	-	<-- S1F1	The equipment requests ON-LINE.
3	S1F2 -->	-	The Host grants ON-LINE.
4	-	<-- S6F11	The equipment sends a Control State LOCAL event report (GemControlStateLOCAL). Events report as appropriate.
5	S6F12 -->	-	The Host acknowledges the report.

Host denies ON-LINE

Step	Host	Equipment	Description
1	-	-	The operator selects Go Online when the equipment OFF-LINE state is active.
2	-	<-- S1F1	The equipment requests ON-LINE.
3	S1F2 -->	-	The Host denies ON-LINE.

Operator sets OFF-LINE

Step	Host	Equipment	Description
1	-	-	The operator selects Go Online when the equipment ONLINE state is active.
2	-	<-- S6F11	The equipment sends an Equipment Requests OFFLINE event report (GemEquipmentOFFLINE). Events report as appropriate.
3	S6F12 -->	-	The Host acknowledges the report.

Operator sets REMOTE

Step	Host	Equipment	Description
1	-	-	The operator selects Go Online in KIDS when the equipment state is ONLINE/LOCAL.
2	-	<-- S6F11	The equipment sends a ControlStateREMOTE event report.
3	S6F12 -->	-	The Host acknowledges the event.

Operator sets LOCAL

Step	Host	Equipment	Description
1	-	-	The operator selects Go Online in KIDS when the equipment state is `ONLINE/REMOTE`.
2	-	<-- S6F11	The equipment sends a `GemControlStateLOCAL` event report.
3	S6F12 -->	-	The Host acknowledges the event.

Host sets OFF-LINE

Step	Host	Equipment	Description
1	S1F15 -->	-	The Host requests `OFF-LINE`.
	-	-	If equipment is online, go to step 3.
2	-	<-- S1F0	The equipment does not process requests when offline. The scenario ends here.
3	-	<-- S1F16	The equipment acknowledges the request and transitions to `OFF-LINE, HOST OFF-LINE` state.
4	-	<-- S6F11	The equipment offline event is sent.
5	S6F12 -->	-	The Host acknowledges the event.

Host sets ON-LINE

Step	Host	Equipment	Description
1	S1F17 -->	-	The Host requests `ON-LINE`.
2	-	-	If equipment is in the `OFF-LINE, HOST OFF-LINE` state, go to step 4.
3	-	<-- S1F18	The equipment denies the request (`ONLACK > 0`). Scenario ends here.
4	-	<-- S1F18	The equipment acknowledges (`ONLACK` = 0) and goes online.
5	-	<-- S6F11	`ControlStateLOCAL` (or `REMOTE`) event.
6	S6F12 -->	-	The Host acknowledges the control state change.

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