

| <i>Name</i> | <i>Format</i> | <i>Description</i> | <i>Values</i> | <i>Class</i> |
|---------------------------------|---------------|--|--|--------------|
| DataSetName | 20 | The name of the Data Set that was uploaded through S7F37, F39, F41, F43; S15F49, F51 transactions that initiated Data Set transfer of large process programs and recipes | | DVVAL |
| DowntimeAlarm | 3(), 5() | Identifier of the last alarm or exception triggering an equipment-initiated transition to UNSCHEDULED DOWNTIME from the PRODUCTIVE or STANDBY states | | SV |
| DowntimeAlarmText | 20 | Text associated with DowntimeAlarm. 0–80 characters. | | SV |
| DowntimeData | 20 | Equipment defined data associated with transitions to, or within, the SCHEDULED or UNSCHEDULED DOWNTIME states. For example, this may be used to carry fault information, the component serial number of a repaired component, or comments entered at the equipment's control panel. 0–256 characters. | | SV |
| EngTime | 5() | Accumulation of time in ENGINEERING reported in minutes | | ECV |
| EqpModel | 20 | Text string describing the equipment model. 1–80 characters. | | SV |
| EqpName | 20 | Text string containing a user-assigned name for equipment. 1–80 characters. Information in the data item EQNAME is a subset of EqpName. | | ECV |
| EqpSerialNum | 20 | Text string describing the product serial number assigned by the manufacturer. 1–80 characters. Information in the data item MDLN is a subset of EqpSerialNum. | | SV |
| EstablishCommunications-Timeout | 52 | The length of time, in seconds, of the interval between attempts to send S1F13 when establishing communications | | ECV |
| EventsEnabled | 0 | Contains the list of events (CEIDs) enabled for reporting (via Stream 6) | Structure: L,n n = # of events enabled 1.<CEID ₁ > . . n.<CEID _n > | SV |

| <i>Name</i> | <i>Format</i> | <i>Description</i> | <i>Values</i> | <i>Class</i> |
|------------------|-------------------------------|---|---|--------------|
| EventLimit | 0, 10, 11, 20, 21, 30, 40, 50 | Used with the Limits Monitoring capability, it contains the LIMITID of the limit reached or crossed by LimitVariable. Since multiple zone transitions for a variable may occur simultaneously (e.g., due to identical limit definitions or a slow data sampling rate), EventLimit has been defined to allow for a list of LIMITIDs. | | DVVAL |
| InterruptionCtr | 50 | The number of transitions to UNSCHEDULED DOWNTIME from PRODUCTIVE | | ECV |
| LastPowerdown | 20 | Timestamp estimate of when the last powerdown or reset occurred. Uses format defined for CLOCK. | | SV |
| LimitVariable | | This variable contains the VID for the variable whose value changed monitoring zones | | DVVAL |
| MaxSpoolTransmit | 54 | The maximum number of messages which the equipment will transmit from the spool in response to an S6,F23 "Transmit Spooled Messages" request. If MaxSpoolTransmit is set to zero, no limit is placed on the messages sent from the spool. Multi-block inquire/grant messages are not counted in this total. | | ECV |
| NSTime | 50 | Accumulation of time in NON-SCHEDULED TIME, reported in minutes | | ECV |
| OperatorCommand | 50 | This data variable is valid in the event the operator issues a command to the equipment. The codes for this variable are equipment-dependent. | | DVVAL |
| OverWriteSpool | 11 | This Equipment Constant is used to indicate to the equipment either to overwrite data in the spool area or to stop spooling whenever the spool area limits are exceeded | = TRUE to overwrite spooled data = FALSE to stop spooling when limits exceeded | ECV |
| PowerdownTime | 20 | This timestamp is periodically updated based on an interval set by the user. It is used to determine the approximate time that the equipment went down in the event of a power loss. Uses format defined for CLOCK. | | SV |
| PowerupState | 20 | Specifies the powerup ARAMS state when powerdown occurs during manufacturing time. Single text digit. | 2 = STANDBY 5 = UNSCHEDULED DOWNTIME | SV |

| <i>Name</i> | <i>Format</i> | <i>Description</i> | <i>Values</i> | <i>Class</i> |
|----------------|---------------|--|--|--------------|
| PPChangeName | 10, 20 | The PPID which was affected upon the event of the creation, editing, or deletion of a Process Program local to the equipment. If the PPID Data Item is also defined and implemented for the equipment, then the values for PPChangeName are subject to the same format restrictions defined for the PPID Data Item. | | DVVAL |
| PPChangeStatus | 51 | The action taken on the Process Program named in PPChangeName. This variable is valid upon the event of the creation, editing, or deletion of a Process Program local to the equipment. | 1 = Credited 2 = Edited 3 = Deleted 4-63 Reserved | DVVAL |
| PPErrors | 20 | Contains information about a failure to verify a text process program | | SV or DVVAL |
| PPExecName | 0, 10, 20 | The PPID(s) of the currently selected Process Program(s). The selection of a new Process Program updates this variable. If multiple Process Programs can be selected, then this variable is a list of PPIDs. If the PPID Data Item is also defined and implemented for the equipment, then the values for PPExecName are subject to the same format restrictions defined for the PPID Data Item. | | SV |

| <i>Name</i> | <i>Format</i> | <i>Description</i> | <i>Values</i> | <i>Class</i> |
|----------------------|---------------|---|--|--------------|
| PPFormat | 51 | Indicates the type or types of process programs and recipes that are supported | 1 = Unformatted process programs 2 = Formatted process programs 3 = Both unformatted and formatted process programs 4 = Execution Recipes 5 = Large unformatted process programs 6 = Large formatted process programs 7 = Both large unformatted and large formatted process programs 8 = Large execution recipes 9 = Both execution recipes and large execution recipes 10 = Both unformatted and large unformatted process programs 11 = Both formatted and large formatted process programs 12 = Both unformatted and large formatted process programs 13 = Both formatted and large unformatted process programs 14 = Unformatted, large unformatted and large formatted process programs 15 = Formatted, large unformatted and large formatted process programs 16 = Formatted, unformatted, large unformatted, large formatted process programs >16 Reserved | SV |
| PrdRecovery | 11 | A boolean value that enables (TRUE) or disables (FALSE) the equipment-initiated return to PRODUCTIVE from UNSCHEDULED DOWNTIME. | | ECV |
| PrdState | 20 | Default ARAMS Substate Code for automated transitions to PRODUCTIVE | | SV |
| PrdTime | 5() | Accumulation of time in PRODUCTIVE, reported in minutes | | ECV |
| PrevARAMSState | 20 | The ARAMS code corresponding to the previous state/substate. Four characters. | | SV |
| PreviousProcessState | 51 | The previous processing state of the equipment, before the most recent process state change | 0-63 Reserved | SV |
| ProcessState | 51 | The current processing state of the equipment | 0-63 Reserved | SV |
| RcpChangeName | 20 | The identifier of the recipe affected upon the event of the creation, editing, or deletion of a recipe | | DVVAL |

| <i>Name</i> | <i>Format</i> | <i>Description</i> | <i>Values</i> | <i>Class</i> |
|---------------------------|---------------|---|--|--------------|
| RcpChangeStatus | 51 | The type of change that occurred for the recipe indicated in RcpChangeName | 0 = No change 1 = Created 2 = Updated (modified) 3 = Stored (new) 4 = Replaced 5 = Deleted 6 = Copied 7 = Renamed 8,9 Reserved >10 Reserved | DVVAL |
| RcpExecName | 0, 20 | The identifier, or a list of identifiers, of currently selected recipes. A zero-length item or list indicates no recipes are currently selected. | | SV |
| ReticleIDVerification | 11 | This equipment constant is used to indicate whether Reticle ID verification is required | | ECV |
| ReticleParticleInspection | 11 | This equipment constant is used to indicate whether Reticle Particle Inspection is required. | | ECV |
| SbyRecovery | 11 | A boolean value that enables (TRUE) or disables (FALSE) the equipment-initiated return to STANDBY from UNSCHEDULED DOWNTIME | | ECV |
| SbyTime | 5() | Accumulation of time in STANDBY, reported in minutes | | ECV |
| SDTime | 5() | Accumulation of time in SCHEDULED DOWNTIME, reported in minutes | | ECV |
| SpoolCountActual | 5() | Used to keep a count of the messages actually contained in the equipment's spool area. Multi-block inquire/grant messages are not spooled and not included in this count. | | SV |
| SpoolCountTotal | 5() | Used to keep a count of the total number of primary messages directed to the spool, regardless of whether placed or retained in the spool. Multi-block inquire/grant messages are not spooled and not included in this count. | | SV |
| SpoolFullTime | 20 | Contains the timestamp from the time the spool last became full. If the spool was not filled during the last spooling period, this will contain a time value prior to the current SpoolStartTime. Uses the same format as the CLOCK variable data item. | | SV |
| SpoolStartTime | 20 | Contains the timestamp from the time spooling last became active. Uses the same format as the CLOCK variable data item. | | SV |

| <i>Name</i> | <i>Format</i> | <i>Description</i> | <i>Values</i> | <i>Class</i> |
|----------------|---------------|--|--|--------------|
| SymptomID | 5() | A numeric code representing the symptom that initiated the user-initiated state change. A value of zero indicates “no symptom”. | | SV |
| SymptomText | 20 | Text describing the SymptomID. 0–80 characters. | | SV |
| TimeFormat | 5() | NOTE 5: The setting of this ECV controls whether the equipment shall send the Data Items STIME and TIME in 12 or 16-byte format. | 0 = 12-byte format 1 = 16-byte format >1 Reserved | ECV |
| TransitionType | 10 | Used with the Limits Monitoring capability, it defines the direction of the zone transition which has occurred. | 0 = Transition from lower to upper zone. 1 = Transition from upper to lower zone. | DVVAL |
| TRATID | 5() | Contains the TRATOMICID of the atomic transfer referenced by the event. | | DVVAL |
| TRJOBIDENT | 5() | Contains the TRJOBID for the transfer job referenced by the event. | | DVVAL |
| TRJOBNM | 20 | Contains the TRJOBNAME for the transfer job referenced by the event. | | DVVAL |
| TRLNK | 5() | Contains the TRLNK value for the atomic transfer referenced by the event | | DVVAL |
| UDTime | 5() | Accumulation of time in UNSCHEDULED DOWNTIME, reported in minutes | | ECV |

9.8 *Object Dictionary* — This section defines the public attributes of objects which are available through SECS-II messages.

9.8.1 The attributes of an object are defined in a table for each object in the following form:

Table 5 Agent Attribute Definition

| <i>Attribute Name</i> | <i>Definition</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|---|---------------|---------------|--------------|
| “ObjType” | Agent object type. | RO | 20 | “Agent” |
| “ObjID” | The agent’s name, assigned by an <i>authorized user</i> . | RO | 20 | |

Table 6 Agent-Specific Dataset Object Attribute Definition

| <i>Attribute Name</i> | <i>Definition</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|------------------------|--|---------------|---------------|--------------|
| “ObjType” | The object type. | RO | 20 | “MRcpASDS” |
| “ObjID” | The object’s identifier. Contains the value in <u>AgentSpec Agent</u> . | RO | 20 | |
| “AgentSpec_Agent” | The name of the <i>executing agent</i> to which the other attributes in the <i>dataset</i> apply. <i>Mandatory</i> . | RO | 20 | |
| “AgentSpec_AttrLength” | The length of the <i>agent-specific</i> attributes, in bytes. <i>Mandatory</i> . | RO | 54 | |
| “AgentSpec_ChgTime” | Timestamp of when an <i>agent-specific</i> attribute was last changed. <i>Mandatory</i> . | RO | 20 | |

| <i>Attribute Name</i> | <i>Definition</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|---|---------------|----------------------------|---|
| “AgentSpec_Comments” | Comments specific to the <i>agent</i> entered by the author. | RW | 20 | Maximum length is 80 characters. |
| “AgentSpec_LinkParam” | A list of <i>variable parameter definitions</i> modified from the list in <u>LinkParam</u> . Valid only for a <i>linked main</i> recipe. <i>Parameter name</i> and form may not be changed. | RO | 00 | List of structures composed of parameter name, value, and restrictions. |
| “Certified” | The certification level for the specific <i>agent</i> , assigned by an <i>authorized user</i> . Reset when <u>AgentSpec LinkParam</u> is modified. Required for <i>certification</i> support. | RW | 52 | |
| “AgentSpec_UD_” | Non-standard attribute defined by the supplier or user. Asterisk indicates the part of the attribute name that is provided in this definition. Must be preserved exactly except by the defining entity. | RO | 10, 11 20, 30 40, 50 | Text form is limited to 80 characters. |

Table 7 Collection Event Object

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Related Data Items</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------|---------------------------|-----------------|
| “ObjType” | Collection Event Object type | RO | 20 | - | “COLLEVENT” |
| “ObjID” | Collection Event Identifiers | RO | 20 | CEID | - |
| “Enabled” | Boolean true means reporting is enabled for a specific CEID. | RW | 11 | CEED | - |
| “EventSource” | Object specifier for object which generates the event for a specific CEID. | RO | 20 | EVNTSRC | - |
| “DataReportList” | List of Report Identifiers linked to a specific CEID. | RO | 20 | - | (list of) RPTID |

Table 8 Data Report Object

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Related Data Items</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------|---------------------------|---------------|
| “ObjType” | Data Report Object Type | RO | 20 | - | “DATARPT” |
| “ObjID” | Object identifier for a data report | RO | 20 | RPTID | - |
| “DataSource” | Source for the variable data, not writable for predefined provider reports | RO | 20 | DATASRC | - |
| “AttrList” | Returns the attribute (or variable) names that this report is requesting from the Data source. | RW | * | - | (list of) VID |

Table 9 Data Source Object

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Related Data Items</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------|---------------------------|---------------|
| “ObjType” | Data Source Object Type | RO | 20 | - | “DataSource” |
| “ObjID” | Identifier of a specific Data Source Object | RO | 20 | DATASRC | - |
| “AttrList” | Name of attributes for a specific Data Source Object | RO | * | - | (list of) VID |

Table 10 Distributed Recipe Namespace Attribute Definition

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|---|---------------|---------------|--------------|
| “ObjType” | The object type. | RO | 20 | “RNSD” |
| “ObjID” | Text. | RO | 20 | |
| “LockedRecipes” | A list of <i>identifiers</i> of all recipes with existing <i>change request records</i> . | RO | 20 | |

| Attribute Name | Description | Access | Format | Value |
|----------------|--|--------|--------|-------|
| “Recorder” | The <i>recorder specifier</i> of the attached <i>distributed recipe namespace recorder</i> . | RO | 20 | |
| “Segments” | A list of <i>specifiers</i> of the <i>distributed recipe namespace segments</i> attached to the <i>namespace</i> . | RO | 20 | |

Table 11 Distributed Recipe Namespace Manager Attribute Definition

| Attribute Name | Description | Access | Format | Value |
|----------------|----------------------------|--------|--------|------------|
| “ObjType” | The object type. | RO | 20 | “RNS_MgrD” |
| “ObjID” | The <i>manager’s</i> name. | RO | 20 | |

Table 12 Distributed Recipe Namespace Recorder Attribute Definition

| Attribute Name | Description | Access | Format | Value |
|--------------------|---|--------|--------|----------------|
| “ObjType” | The object type. | RO | 20 | “RNSDRecorder” |
| “ObjID” | Text. | RO | 20 | |
| “LockedRecipes” | List of <i>identifiers</i> of recipes with existing <i>change request records</i> . | RO | 00 | |
| “Namespace” | Identifies the <i>namespace</i> to which the recorder is attached. May be set by the manager. | RO | 20 | |
| “NamespaceManager” | Identifies the <i>distributed recipe namespace manager</i> . May be set by the manager. | RO | 20 | |
| “Segments” | List of <i>specifiers</i> of currently attached segments. | RO | 00 | |

Table 13 Distributed Recipe Namespace Segment Attribute Definition

| Attribute Name | Description | Access | Format | Value |
|-----------------------|---|--------|--------|---------------|
| “ObjType” | The object type. | RO | 20 | “RNSDSegment” |
| “ObjID” | The object name (identifier). | RO | 20 | |
| “Namespace” | The name (ObjID) of the <i>namespace</i> to which the <i>segment</i> belongs. May be set by the manager. | RO | 20 | |
| “NamespaceManager” | Identifies the <i>distributed recipe namespace manager</i> . May be set by the manager. | RO | 20 | |
| “RecipeReadOnlyLevel” | Used to track the corresponding attribute of the <i>namespace</i> to which the <i>segment</i> belongs. May be set by the manager. | RO | 52 | |

Table 14 Exception Attributes

| Attribute Name | Description | Access | Format | Related Data Items | Value |
|----------------|---|--------|--------|--------------------|--|
| “ObjType” | The object type | RO | 20 | - | “EXCEPTION” |
| “ObjID” | The identifier of a specific Exception | RO | 20 | EXID | - |
| “EXType” | Identifies the type of exception | RO | 20 | - | Select from set: “ALARM” “ERROR” |
| “EXMessage” | Text message describing the abnormal situation monitored. | RO | 20 | - | Max. length of 80 characters |
| “EXEnabled” | Indicates that reporting to the decision authority on the exception condition is enabled. | RW | 11 | - | Boolean; TRUE is enabled. |

| Attribute Name | Description | Access | Format | Related Data Items | Value |
|--------------------|--|--------|--------|--------------------|--|
| “EXRecoveryAction” | List of possible recovery actions (EXRecovery). | RO | 20 | - | list of text |
| “EXState” | Current state of an Exception Object. The Exception Object state is usually defined as a combination of substates and concurrent states. | RO | 20 | - | Composed from the set: “CLEARED” “SET” “NOTPOSTED” “POSTED” “NOTRECOVERING” “RECOVERING” “ABORTINGRECOVERY” |

Table 15 Execution Recipe Attribute Definition

| Attribute Name | Definition | Acc. | Rqmt | Form | Default Value |
|----------------------------------|---|------|------|---|---------------|
| <i>Identification Attributes</i> | | | | | |
| “ObjType” | The object type. | RO | Y | Text: “ERcp” | “ERcp” |
| “ObjID” | An identifier derived from Namespace, Class, Name, and Version. | RO | Y | Formatted text. | - |
| “Namespace” | The name of the <i>originating namespace</i> . | RO | Y | Text. | - |
| “Name” | A logical name assigned by the user when the recipe is <i>created</i> . | RO | Y | Text. | - |
| “Class” | The recipe’s class (e.g., “/PROCESS/” OR “/PROCESS/LOADER/”). | RO | Y | Formatted text: “CLASS/CLASS/.. /CLASS/” | - |
| “Version” | The version of the recipe. | RO | Y | Text. | - |
| <i>Mandatory Attributes</i> | | | | | |
| “ExecAttrLength” | The <i>length attribute</i> for the attributes of the <i>execution recipe</i> . Calculated when the recipe is <i>downloaded</i> and whenever an attribute changes. <i>Mandatory</i> . | RO | Y | Unsigned integer | - |
| “ExecChgTime” | The <i>timestamp</i> of a change to the attributes of the <i>execution recipe</i> . <i>Mandatory</i> . | RO | Y | Formatted text, <i>timestamp</i> format | - |
| “AttrLength” | Preserved. <i>Mandatory</i> . | RO | Y | Unsigned integer | - |
| “AttrChgTime” | Preserved. <i>Mandatory</i> . | RO | Y | Timestamp format | - |
| “EditTime” | Preserved unless recipe is modified. <i>Timestamp</i> of when the <i>body</i> was <i>created</i> or modified. <i>Mandatory</i> . | RO | Y | Formatted text <i>Timestamp</i> format | - |
| “BodyLength” | Preserved unless recipe is modified. Length of the recipe’s body, in bytes. <i>Mandatory</i> . | RO | Y | Unsigned integer | - |
| “BodyFormat” | Indicates the form and format of the recipe’s <i>body</i> . | RO | Y | Enumerated unsigned integer: 0 = <i>source</i> , 1 = <i>object</i> , > 1 reserved. | 0 |
| “Verified” | Indicates whether the recipe’s body is syntactically correct. | RO | Y | Boolean. | FALSE |
| “Linked” | Indicates whether the recipe is <i>linked</i> . | RO | Y | Boolean. | FALSE |

| Attribute Name | Definition | Acc. | Rqmt | Form | Default Value |
|--------------------------------|---|------|------|---|---------------|
| "ChangedBody" | Set to TRUE if the recipe body has changed without a subsequent upload to the originating namespace. Note: this attribute is never updated to a namespace. Required only if recipe can be changed or created. | RO | Y | Boolean. | FALSE |
| "ExecChgCtl" | Preserved. Specifies change control requirements for recipe. | RO | Y | Binary. Bitwise: 1 - may change 2 - change notification required 4 - recipe may be selected after change, 8 - most recent parameter settings shall be saved. Any combination of these four bits is allowed. | 0 |
| <i>Optional Attributes</i> | | | | | |
| "AgentSpec_Comments" | Copied from the original <i>agent-specific</i> attribute when downloaded. Set by the user. | RO | N | Text. Maximum length is 80 characters. | - |
| "ApprovalLevel" | Indicates the level of approval assigned by an <i>authorized</i> user. | RO | N | Unsigned integer | 0 |
| "Certified" | Preserved from the <i>agent-specific</i> attribute as downloaded. May be used as control for production-worthy recipes. | RO | N | Unsigned integer | 0 |
| "Comments" | User comments. Preserved from the <i>generic</i> attribute as downloaded. | RO | N | Text. Maximum length is 80 characters. | - |
| "EditedBy" | Preserved unless recipe is modified. The name of the person or <i>executing agent</i> who last modified the recipe. | RO | N | Text. Maximum length is 40 characters. | - |
| "EstRunTime" | The nominal or estimated execution (run) time of the recipe, in seconds. Used for scheduling purposes. Preserved from the <i>generic</i> attribute as downloaded. | RO | N | Unsigned integer | 0 |
| "ExecLinkParam" | Preserved unless last value is changed (Section 9.7.4). Contains the list of <i>parameter definitions</i> including any <i>agent-specific</i> modifications. Required for <i>variable parameter</i> support. | RO | N | Structure composed of parameter name, initial value, and restrictions. | NULL |
| "LinkList" | Preserved. A complete list of recipe <i>specifiers</i> for a <i>linked recipe set</i> . Required for multi-part recipe support. | RO | N | List of formatted text. | NULL |
| "SrcRcpID" | For a derived <i>object form</i> recipe, contains the recipe <i>identifier</i> of the original <i>source form</i> recipe. Required only for <i>derived object form</i> recipes. | RO | N | Formatted text. | NULL |
| "VerificationID" | Identification code used by the <i>verifier</i> of the recipe. May be used to determine out-of-date formats that need to be <i>re-verified</i> . | RO | N | Text. Maximum length is 40 characters. | NULL |
| <i>Non-Standard Attributes</i> | | | | | |
| AgentSpec_UD_* | Preserved from the original <i>agent-specific</i> attributed as downloaded. | RO | N | Defined by supplier or user. Text limited to 80 characters. | - |

| <i>Attribute Name</i> | <i>Definition</i> | <i>Acc.</i> | <i>Rqmt</i> | <i>Form</i> | <i>Default Value</i> |
|-----------------------|---|-------------|-------------|--|----------------------|
| UD_* | Non-standard attribute defined by supplier or <i>user</i> . Asterisk indicates the part of the attribute name that is provided in this definition. Shall be preserved exactly except by the entity that defined it. | RO | N | Varies with definition. Text form is limited to 80 characters. | - |

Table 16 Managed Recipe Attribute Definition

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|--|---------------|-------------------------|---|
| “ObjType” | The object type. | RO | 20 | “MRcp” |
| “ObjID” | An identifier derived from <u>Class</u> , <u>Name</u> , and <u>Version</u> . No part of a recipe’s identifier shall be changed except through <i>renaming</i> . | RO | 20 | |
| (other) | Description of the information contained. | RO or RW | Varies with definition. | Varies with definition. |
| “Name” | A logical name assigned by the user when the recipe is <i>created</i> or <i>renamed</i> . | RO | 20 | |
| “Class” | The recipe’s class (e.g., “/PROCESS/” or “/PROCESS/LOADER/”). | RO | 20 | Formatted text: “CLASS/CLASS/./CLASS/” |
| “Version” | The version of the recipe. | RO | 20 | |
| “AttrLength” | The total length of the <i>generic</i> attributes, in bytes. <i>Mandatory</i> . | RO | 5() | |
| “AttrChgTime” | Timestamp of the last change to a <i>generic</i> attribute. <i>Mandatory</i> . | RO | 20 | |
| “BodyLength” | Length of the recipe’s body, in bytes. <i>Mandatory</i> . | RO | 5() | |
| “EditTime” | Timestamp of when the <i>body</i> was <i>created</i> or last <i>updated</i> . <i>Mandatory</i> . | RO | 20 | <i>Timestamp</i> format: “YYYYMMDDhhmmsscc” |
| “BodyFormat” | Indicates the form and format of the recipe’s <i>body</i> . <i>Default</i> is zero. | RO | 52 | 0 = source, 1 = object, >1 reserved. |
| “Verified” | Indicates whether the recipe’s body is syntactically correct. Reset when the recipe is <i>created</i> or <i>updated</i> . <i>Default</i> is FALSE. | RO | 11 | |
| “Linked” | Indicates whether the recipe is <u>linked</u> . Reset when the recipe is <i>originated</i> , <i>verified</i> , or <i>unlinked</i> . <i>Default</i> is FALSE. | RO | 11 | |
| “ApprovalLevel” | Indicates the level of approval assigned by an <i>authorized user</i> . <i>Default</i> is zero. Reset when the recipe is <i>originated</i> or <i>linked</i> . For a <i>linked</i> recipe, may not be higher than any of its <i>subrecipes</i> . | RW | 52 | |
| “Comments” | User comments. | RW | 20 | Maximum length is 80 characters. |
| “EditedBy” | The name of the person who last edited the recipe. | RO | 20 | Maximum length is 40 characters. |
| “EstRunTime” | The nominal or estimated execution (run) time of the recipe, in seconds. Reset when the recipe, is <i>created</i> or <i>updated</i> . Set when the recipe is <i>verified</i> . May be recalculated to total time for a <i>main</i> recipe when <i>linked</i> . Used for scheduling purposes. Algorithm for calculation shall be documented. <i>Default</i> is 0. | RW | 54 | |

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------------------|--|
| “ExecChgCtrl” | Specifies change control requirements for recipe. Default is 0. Combinations of bits are used to indicate multiple permissions. | RW | 10 | Binary. Bitwise (MSB = 8): 1 - the recipe body may be changed 2 - change notification required 4 - recipe may be selected after change, 8 - most recent parameter settings shall be saved. Any combination of these four bits is allowed |
| “ExtRef” | A list of all recipe <i>specifiers</i> as referenced within the recipe. Explicit <i>versions</i> not required. Reset when the recipe is <i>created</i> , <i>updated</i> , and <i>verified</i> . | RO | 00 | List of items of format 20. |
| “LinkList” | A complete list of recipe <i>specifiers</i> found in the <u>ExtRef</u> attribute of a <i>main</i> recipe and all of its <i>subrecipes</i> , with duplicates removed and all <i>versions</i> explicitly determined. Set for the <i>main</i> recipe when <u>linked</u> . Reset when the recipe is <i>originated</i> or <i>verified</i> . Required for multi-part recipe support. | RO | 00 | List of items of format 20. |
| “LinkParam” | A list of all variable parameter definitions contained in the <u>Parameters</u> attribute of a <i>main</i> recipe and all of its <i>subrecipes</i> , with duplicates removed. Reset when the recipe is <i>created</i> , <i>updated</i> , or <i>verified</i> . Set when the recipe is <i>linked</i> . Required for <i>variable parameter</i> support. | RO | 00 | List of parameter definition structures composed of parameter name, initial value, and restrictions. |
| “Parameters” | A list of variable parameter definitions contained in the recipe. Reset when the recipe is <i>created</i> , <i>updated</i> , and <i>verified</i> . Set when the recipe is <i>verified</i> . Required only for <i>variable parameter</i> support. | RO | 00 | List of parameter definition structures composed of parameter name, initial value, and restrictions. |
| “SrcRecID” | <i>Identifier</i> of the <i>source form</i> recipe from which a <i>derived object form</i> recipe is derived. Value determined by the <i>verifier</i> of the recipe. Required only for support of <i>derived object form</i> recipes. | RO | 20 | |
| “VerificationID” | Identification code set by the <i>verifier</i> of the recipe. May be used to determine out-of-date formats that need to be <i>re-verified</i> . | RO | 20 | Maximum length is 40 characters. |
| “UD_” | Non-standard attribute defined by supplier or <i>user</i> . Asterisk indicates the part of the attribute name that is provided in this definition. Shall be preserved exactly except by the entity that defined it. | RO | 10, 11, 20, 3(), 4(), 5() | Text form is limited to a maximum of 80 characters. |

Table 17 Process Job Attributes

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Related Data Item</i> | <i>Value</i> |
|-----------------------|---|---------------|---------------|--------------------------|-----------------------------------|
| “ObjType” | Name of the Object Type | RO | 20 | - | “PROCESSJOB” |
| “ObjID” | Identifier of a Process Job | RO | 20 | PRJOBID | - |
| “PRMt1Type” | Type of material being processed | RO | 20 | - | allowed values: “css” “wfr” |
| “PRMt1NameList” | Process Material Name, identifies material being processed by a job, which could be more than one item. | RO | 20 | - | (list of) Text |

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Related Data Item</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------|--------------------------|---|
| “RecID” | Object Specifier of Recipe used by a Process Job, see SEMI E39 and SEMI E42 | RO | 20 | - | - |
| “PRRecipeMethod” | Indicates any special handling for a Process Job’s Recipe | RO | 20 | - | allowed values: “STANDARD” “USETUNING” |
| “PRJobState” | Indicates the current state of a Process Job. The state of a job may be a combination of sub-states and concurrent states. | RO | 20 | - | Composed from the set: “WAITINGFOR JOB” “JOBQUEUED” “JOB CANCELLED” “JOBACTIVE” “SETUP” “WAITINGFORSTART” “PROCESSING” “NOTPAUSED” “PAUSING” “PAUSED” “NOTSTOPPING” “STOPPING” “NOTABORTING” “ABORTING” “PROCESSCOMPLETE” “JOBCOMPLETE” |
| “PRProcessStart” | Processing should start automatically after Job is defined when this Boolean is set TRUE | RO | 11 | - | Boolean |

Table 18 Recipe Executor Attribute Definition

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Rqmt</i> | <i>Form</i> |
|---------------------------|--|---------------|-------------|---|
| “ObjType” | The object type | RO | Y | Text = “RcpExec” |
| “ObjID” | Text | RO | Y | Text |
| “DefaultNamespace” | The name of an <i>executing agent’s name-space</i> used for all hardware-dependent and other <i>agent-specific</i> recipes. | RW | Y | Text |
| “ProdApprove” | The minimum value of a recipe’s <i>approval level</i> accepted during productive and standby states. Required for SEMI E10 support only. | RW | N | Unsigned integer |
| “ProdCertify” | The minimum value of a recipe’s <i>certification level</i> accepted during productive and standby states. Required for SEMI E10 support only. | RW | N | Unsigned integer |
| “RunCycleUnit” | The process unit on which the calculation of the estimated value of the recipe <i>generic attribute</i> EstRunTime is based. | RO | N | Case-sensitive formatted text composed of a unit of measure and an optional numeric suffix. Compliant with SEMI E5, Section 12. |
| “RecipeSelectID” | A list of recipe <i>identifiers</i> for the currently selected recipes. | RO | Y | List of formatted text. |
| “RecipeSelect-Parameters” | A list of all <i>parameter definitions</i> in effect for the <i>i</i> th recipe <i>identifier</i> in RecipeSelectID. The maximum value for <i>i</i> is determined by the equipment supplier as the maximum number of recipes which may be <i>selected</i> at the same time. Required if variable parameters are supported. | RO | N | List of structures composed of parameter name, parameter value, parameter restriction. |

Table 19 Recipe Namespace Attribute Definition

| <i>Attribute Name</i> | <i>Definition</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------|------------------------------------|
| “ObjType” | The object type. | RO | 20 | “RNS” |
| “ObjID” | The <i>name</i> of the <i>namespace</i> . | RO | 20 | A name of “Default” is prohibited. |
| “RecipeReadOnlyLevel” | The level of <i>approval</i> at which recipes are <i>read-only</i> . | RW | 52 | |
| “Members” | The <i>names</i> of <i>agents</i> capable of <i>verifying</i> and <i>executing</i> the recipes in the <i>namespace</i> . | RW | 00 | List of items of format 20. |

Table 20 Recipe Namespace Manager Attribute Definition

| <i>Attribute Name</i> | <i>Definition</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|--|---------------|---------------|--------------|
| “ObjType” | The object type. | RO | 20 | “RNS_Mgr” |
| “ObjID” | The <i>manager’s</i> name. | RO | 20 | |
| “NamespaceName” | The <i>name</i> of the <i>namespace</i> managed. | RO | 20 | |

Table 21 Table Attribute Definition

| <i>Attribute Name</i> | <i>Definition</i> | <i>Access</i> | <i>Format</i> | <i>Value</i> |
|-----------------------|---|---------------|---------------|------------------|
| “ObjType” | The object type. | RO | 20 | “Table” |
| “ObjID” | The object’s identifier. | RO | 20 | 1–80 characters. |
| “NumCols” | Number of columns. | RO | 5() | Non-zero. |
| “NumRows” | Number of rows. | RO | 5() | Non-zero. |
| “TableLength” | Total number of bytes required to store the table elements, exclusive of any formatting required for storage. | RO | 5() | Non-zero. |

Table 22 Trace Object

| <i>Attribute Name</i> | <i>Description</i> | <i>Access</i> | <i>Format</i> | <i>Related Data Items</i> | <i>Value</i> |
|-----------------------|---|---------------|---------------|---------------------------|-----------------|
| “ObjType” | Trace Report Object type | RO | 20 | - | “TRACE” |
| “ObjID” | Identifier of a specific Trace Report | RO | 20 | TRID | - |
| “Enabled” | Boolean true means the specific Trace Report is enabled. | RW | * | CEED | - |
| “ReportID” | List or report linked to this Trace Report | RO | 20 | - | (list of) RPTID |
| “SamplePeriod” | Time between report samples given in floating point seconds. | RW | 4 () | TRSPER | - |
| “TotalSamples” | The maximum number of samples that this Trace Report will perform. | RW | * | TOTSMP | - |
| “GroupSize” | Number of trace reports to be grouped before a report is sent. | RW | * | REPGSZ | - |
| “StartEventID” | Identifier of the event which starts trace reporting. | RW | 20 | CEID | - |
| “StartEvtSrcSpec” | Source for the start event | RW | 20 | EVNTSRC | - |
| “StopEventID” | Identifier of the event which stops trace reporting. | RW | 20 | CEID | - |
| “StopEvtSrcSpec” | Source for the stop event | RW | 20 | EVNTSRC | - |
| “AutoDelete” | Boolean true means this report is deleted when reporting is complete. | RW | 11 | TRAUTOD | - |
| “ReportChangeOnly” | Boolean, if true, then trace reports are sent only if at least one of the reported variables changes. | RW | 11 | RPTOC | - |

9.8.2 *attribute name* — A reserved text string, of at most 40 characters, that is unique for that object.

9.8.3 *description* — A description of the attribute.

9.8.4 *access* — Indicates whether the attribute may be set through messages. Access is either read-only (RO) or read-write (RW).

9.8.5 *format* — Indicates the type of data (format code).

9.8.6 *timestamp format* — Text form indicating date and time in the format “YYYYMMDDhhmmsscc”.

9.8.7 *related data items* — Indicates an explicit relationship with a corresponding data item.

9.8.8 *value* — Specifies any restrictions on the possible values. Examples of restrictions include exclusion of zero for format 5(), a maximum length for text, a format imposed on text, an order imposed on a list, or an enumerated set of valid values.

9.8.9 *Requirements*

- The attributes “ObjType” and “ObjID” are required for all object definitions and shall use format 20.
- The attribute “ObjType” shall be assigned a fixed value for each object.
- The value of “ObjID” may not be changed by using SetAttr (S14F3).

9.8.10 The value of “ObjType” may be used for messages using the data item OBJTYPE. The value of the attribute “ObjID” may be used for messages using the data item OBJID.

9.8.11 The name of a public attribute may be used for messages using the data item ATTRID. The value of a public attribute may be used for messages using the data item ATTRDATA.

9.8.12 Variable data items defined in Section 9.7 may be regarded as attributes of the object type “Equipment”, where SVs and DVVALs are RO and ECVs are RW.

9.9 With the use of Harel⁴ state diagrams to describe the behavior of objects, an object’s state must be describable as a combination of a set of sub-states and concurrent states. The rules for describing the state of an object are: (1) use the comma (’,’) to delimitate concurrent states, (2) use the foreslash (‘/’) to delimit a super-state and sub-state, (3) to deliver the set of lowest level concurrent states, and (4) optionally omit super-state names when there are no ambiguities in the names of the lowest level states.

9.9.1 Please refer to Figure 3 in order to follow the discussions for the notations. In Harel notation, ‘pump’ and ‘vacuum’ are concurrent states. The text to specify this relation in a response to a request for state is ‘pump, vacuum’. The comma can be read as meaning ‘and’. ‘on’ and ‘off’ are sub-states of ‘pump’. ‘vent’, ‘rough’, and ‘Hi-V’ are sub-states of ‘vacuum’. The sub-state syntax is ‘state/sub-state’ where the ‘/’ can be read as ‘is in sub-state’. So using the example in Figure 3, if the pump is off and the vacuum is vented, then the text message which conveys this is ‘pump/off, vacuum/vent’. This message can be shortened to ‘off,vent’ because there is no ambiguity in doing so.

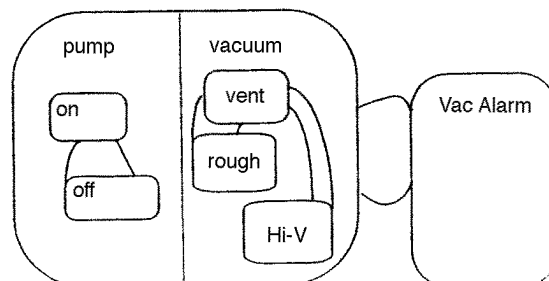


Figure 3
State Chart Example

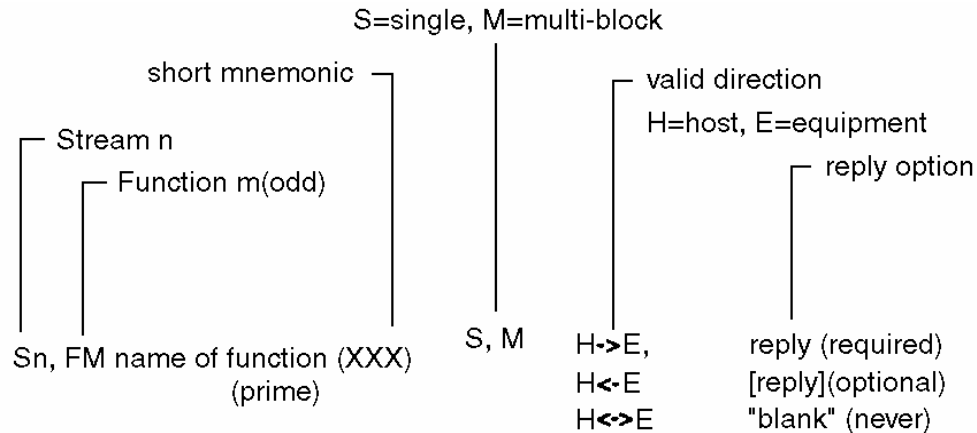
⁴ Harel D. “Statecharts: A Visual Formalism for Complex Systems”, Science of Computer Programming, 8, 1987, pp. 231-274. Elsevier Science, P.O. Box 945, New York, NY 10159-0945, <http://www.elsevier.nl/homepage/browse.htm>

10 Message Detail

10.1 *Intent* — This section defines a number of specific functions in different streams which can be used as a basis for communication between host and equipment. The functions are defined in the form of transaction message pairs according to the transaction level requirements specified in Section 8.

10.2 The functions are described in a standard form which involves specification of the number, name, single or multiple block, direction of communication, nature of reply required, description, variable definition, and the detailed structure of the message in terms of lists and items. Double lines separate streams, and single lines separate transactions to aid readability.

10.2.1 The abbreviations used in each transaction are as follows:



| Description |
|---|
| A description of the action generated by the function. |
| Structure |
| Detailed structure showing lists and defined items. Lists are denoted by a capital L followed by the length separated by a comma. The individual elements in the list are numbered on separate lines. Nested lists are indented to emphasize the structure. The detailed form of the items is given in the define section at the beginning of the transaction. The symbols "<" and ">" are used to enclose each item in the structure data and imply that there is an item header. A detailed description of each data item as well as a list of the allowable data formats can be found in the Data Item Dictionary. |
| Exception |
| Special cases in the structure that have a different meaning. |

Sn,Fm+1 Name of function (secondary) (same structure as above except never with reply)

10.3 *Message Usage* — This section discusses message features and where they may be used.

10.3.1 *Zero Length Items and Lists* — Certain message definitions may use zero length data items and zero length lists as a technique to convey specific information to the receiver of the message. For commands (i.e., “Do Something”) and requests (i.e., “Return Some Data”), it may be used to mean “Use default values for the data item(s) which were not included”. The default may be a specific value or a value chosen by the equipment.

10.3.1.1 For messages reporting data (either responses to requests or asynchronous reports), the technique may be used to indicate that the desired information is not available or not applicable. In some cases, the fact that data is unavailable may indicate success or failure of a command.

10.3.1.2 Certain message definitions may define a zero length data item or a zero length list to mean “the information is not supplied.” The receiving party should react to this lack of information as it deems appropriate.

10.3.2 *Compliance to Message Definitions* — Any given standard SECS-II message shall comply to the format shown in the Message Definition for that Stream and Function. Specifically:



1. The message shall contain all Lists and Data Items shown as required in the Message Definition.
2. The message shall not contain any Lists or Data Items not shown in the Message Definition, unless the Message Definition specifically allows this.
3. The message shall not contain any List Item or Data Item with zero length unless the Message Definition specifically defines a meaning for such a zero length item.

10.4 *Stream 0 and Function 0* — Stream 0 is always defined as not used since a 0 is the most likely error. No functions are defined in stream 0.

10.4.1 Function 0 exists in all streams and has the same special meaning in each stream. A function 0 message closes a transaction, so that the originator will not have to wait for a transaction timeout to proceed. Function 0 is sent in lieu of the expected secondary message when the interpreter cannot, because of a transmission error or some other reason, respond with the expected reply. It is not a requirement that the interpreter send function 0 to close a transaction.

10.5 *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.

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F0 Abort Transaction (S1F0) | S,H<->E |
| <i>Description</i> | |
| Used in lieu of an expected reply to abort a transaction. Function 0 is defined in every stream and has the same meaning in every stream. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F1 Are You There Request (R) | S,H<->E,reply |
| <i>Description</i> | |
| Establishes if the equipment is on-line. A function 0 response to this message means the communication is inoperative. In the equipment, a function 0 is equivalent to a timeout on the receive timer after issuing S1,F1 to the host. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F2 On Line Data (D) | S,H<->E |
| <i>Description</i> | |
| Data signifying that the equipment is alive. | |
| <i>Structure</i> | |
| L, 2 1. <MDLN> 2. <SOFTREV> | |
| <i>Exception</i> | |
| The host sends a zero-length list to the equipment. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F3 Selected Equipment Status Request (SSR) | S,H->E,reply |
| <i>Description</i> | |
| A request to the equipment to report selected values of its status. | |
| <i>Structure</i> | |
| The following structure is approved for all item formats and should be used by all new implementations: | |
| L,n 1. <SVID ₁ > . . n. <SVID _n > | |
| The following structure is included for compatibility with previous implementations and may only be used for items of format 3() and 5(): | |
| <SVID ₁ , . . . ,SVID _n > | |
| <i>Exception</i> | |
| A zero-length list (structure 1) or item (structure 2) means report all SVIDs. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F4 Selected Equipment Status Data (SSD) | M,H<-E |
| <i>Description</i> | |
| The equipment reports the value of each SVID requested in the order requested. The host remembers the names of values requested. | |
| <i>Structure</i> | |
| L,n 1. <SV ₁ > . . n. <SV _n > | |
| <i>Exception</i> | |
| A zero-length list item for SV _i means that SVID _i does not exist. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F5 Formatted Status Request (FSR) | S,H->E,reply |
| <i>Description</i> | |
| A request for the equipment to report the status according to a pre-defined fixed format. | |
| <i>Structure</i> | |
| <SFCD> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F6 Formatted Status Data (FSD) | M,H<-E |
| <i>Description</i> | |
| The equipment reports the value of status variables according to the SFCD. | |
| <i>Structure</i> | |
| Depends upon the structure specified by the status form. | |
| <i>Exception</i> | |
| A zero-length item means that no report can be made. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F7 Fixed Form Request (FFR) | S,H->E,reply |
| <i>Description</i> | |
| A request for the form used in S1,F6. | |
| <i>Structure</i> | |
| <SFCD> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F8 Fixed Form Data (FFD) | M,H<-E |
| <i>Description</i> | |
| The form is returned with the name of each value and the data format item having a zero length as a two-element list in the place of each single item to be returned in S1,F6. | |
| <i>Structure</i> | |
| Depends upon the form being specified. | |
| <i>Exception</i> | |
| A zero-length item means the form is unavailable. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F9 Material Transfer Status Request (TSR) | S,H->E,reply |
| <i>Description</i> | |
| A request to report the status of all material ports to the host. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F10 Material Transfer Status Data (TSD) | M,H<-E |
| <i>Description</i> | |
| The equipment reports to the host the transfer status of all material ports. | |
| <i>Structure</i> | |
| L, 2 1. <TSIP ₁ , . . . , TSIP _n > 2. <TSOP ₁ , . . . , TSOP _n > | |
| <i>Exception</i> | |
| A zero-length item means there are no such ports. A zero-length list means there are no ports. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F11 Status Variable Namelist Request (SVNR) | S,H->E,reply |
| <i>Description</i> | |
| A request to the equipment to identify certain status variables. | |
| <i>Structure</i> | |
| L, n 1. <SVID ₁ > . . n. <SVID _n > | |
| <i>Exception</i> | |
| A zero length means report all SVIDs. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F12 Status Variable Namelist Reply (SVNRR) | M,H<-E |
| <i>Description</i> | |
| The equipment reports to the host the name and units of the requested SVs. | |
| <i>Structure</i> | |
| L, n 1. L, 3 1. <SVID ₁ > 2. <SVNAME ₁ > 3. <UNITS ₁ > 2. L, 3 . . n. L, 3 1. <SVID _n > 2. <SVNAME _n > 3. <UNITS _n > | |
| <i>Exception</i> | |
| Zero-length ASCII items for both SVNAME _i and UNITS _i indicates that the SVID does not exist. | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F13 Establish Communications Request (CR) | S,H<->E,reply |
| <i>Description</i> | |
| The purpose of this message is to provide a formal means of initializing communications at a logical application level both on power-up and following a break in communications. It should be the following any period where host and Equipment SECS applications are unable to communicate. An attempt to send an Establish Communications Request (S1,F13) should be repeated at programmable intervals until an Establish Communications Acknowledge(S1,F14) is received within the transaction timeout period with an acknowledgement code accepting the establishment. | |
| <i>Structure</i> | |
| L, 2 1. <MDLN> 2. <SOFTREV> | |
| <i>Exception</i> | |
| The host sends a zero-length list to the equipment. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F14 Establish Communications Request Acknowledge (CRA) | S,H<->E |
| <i>Description</i> | |
| Accept or deny Establish Communications Request (S1,F13). MDLN and SOFTREV are on-line data and are valid only if COMMACK = 0. | |
| <i>Structure</i> | |
| L, 2 1. <COMMACK> 2. L, 2 1. <MDLN> 2. <SOFTREV> | |
| <i>Exception</i> | |
| The host sends a zero-length list for item 2 to the equipment. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F15 Request OFF-LINE (ROFL) | S,H->E,reply |
| <i>Description</i> | |
| The host requests that the equipment transition to the OFF-LINE state. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F16 OFF-LINE Acknowledge (OFLA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <OFLACK> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F17 Request ON-LINE (RONL) | S,H->E,reply |
| <i>Description</i> | |
| The host requests that the equipment transition to the ON-LINE state | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S1,F18 ON-LINE Acknowledge (ONLA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <ONLACK> | |
| <i>Exception</i> | |
| None | |

10.5.1 Macro Level Messages

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|----------------------------|
| S1,F19 Get Attribute (GA) | S,H<—>E,reply ⁵ |
| <i>Description</i> | |
| Request for attribute data relating to the specified object or entity within the equipment. | |
| <i>Structure</i> | |
| L, 3 1. <OBJTYPE> 2. L, m [m = number of objects for which attributes requested] 1. <OBJID ₁ > . . m. <OBJID _m > 3. L, n [n = number of attributes requested for each object] 1. <ATTRID ₁ > . . n. <ATTRID _n > | |
| <i>Exception</i> | |
| A zero-length list (m = 0) is a request for attributes of all objects of the specified type. A zero-length list (n = 0) is a request for all attributes of the object(s) to be returned in a predefined order. | |

⁵ Material Movement Management used only the Host to Equipment direction for this message. However, both directions are included for future compatibility with Recipe Management and other future services.

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S1,F20 Attribute Data (AD) | M,H<—>E |
| <i>Description</i> | |
| This message is used to transfer the requested set of object attributes. The order of requested objects and attributes is retained from the primary message. | |
| <i>Structure</i> | |
| L, 2 1. L, m [m = number of objects for which data is sent] 1. L, n [n = number of attributes returned for OBJID ₁] 1. <ATTRDATA ₁ > . . n. <ATTRDATA _n > . . m. L, n [n = number of attributes returned for OBJID _m] 1. <ATTRDATA ₁ > . . n. <ATTRDATA _n > 2. L, p [p = # errors reported] 1. L, 2 1. <ERRCODE ₁ > 2. <ERRTEXT ₁ > . . p. L, 2 1. <ERRCODE _p > 2. <ERRTEXT _p > | |
| <i>Exception</i> | |
| If m = 0, it indicates that the specified OBJTYPE is unknown. If any n = 0, it indicates that the corresponding object was not found. If any ATTRDATA item is reported as a zero-length item, it indicates that the specified attribute does not exist. If no errors were found, p = 0. | |

10.6 *Stream 2 Equipment Control and Diagnostics* — Messages which deal with control of the equipment from the host. This includes all remote operations and equipment self-diagnostics and calibration but specifically excludes the control operations which are associated with material transfer (see Stream 4), loading of executive and boot programs (Stream 8), and all file and operating system calls (Streams 10, 13). See also continuations in Stream 17.

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F0 Abort Transaction (S2F0) | S,H<->E |
| <i>Description</i> | |
| Same form as S1,F0 | |
| <i>Structure</i> | |
| <i>Exception</i> | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F1 Service Program Load Inquire (SPI) | S,H<->E,reply |
| <i>Description</i> | |
| Either the host or equipment wants to send the specified program. | |
| <i>Structure</i> | |
| L, 2 1. <SPID> 2. <LENGTH> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F2 Service Program Load Grant (SPG) | S,H<->E |
| <i>Description</i> | |
| Provides permission to load | |
| <i>Structure</i> | |
| <GRANT> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F3 Service Program Send (SPS) | M,H<->E, reply |
| <i>Description</i> | |
| The data associated with the S2,F1 inquire is sent. If S2,F3 is multi-block, it must be preceded by the S2,F1/S2,F2 Inquire/Grant transaction. | |
| <i>Structure</i> | |
| <SPD> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F4 Service Program Send Acknowledge (SPA) | S,H<->E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <SPAACK> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F5 Service Program Load Request (SPR) | S,H<->E,reply |
| <i>Description</i> | |
| A service program is requested. | |
| <i>Structure</i> | |
| <SPID> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F6 Service Program Load Data (SPD) | M,H<->E |
| <i>Description</i> | |
| A service program is sent. | |
| <i>Structure</i> | |
| <SPD> | |
| <i>Exception</i> | |
| A zero-length item means that the requested program cannot be returned. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F7 Service Program Run Send (CSS) | S,H->E,reply |
| <i>Description</i> | |
| Start the requested program | |
| <i>Structure</i> | |
| <SPID> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F8 Service Program Run Acknowledge (CSA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <CSAACK> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F9 Service Program Results Request (SRR) | S,H->E,reply |
| <i>Description</i> | |
| Ask for results of service program | |
| <i>Structure</i> | |
| <SPID> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F10 Service Program Results Data (SRD) | M,H<-E |
| <i>Description</i> | |
| Get the results back | |
| <i>Structure</i> | |
| <SPR> | |
| <i>Exception</i> | |
| A zero-length item means SPR does not exist. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F11 Service Program Directory Request (SDR) | S,H<->E,reply |
| <i>Description</i> | |
| There may be more than one service program. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F12 Service Program Directory Data (SDD) | S,H<->E |
| <i>Description</i> | |
| A list of service program names. | |
| <i>Structure</i> | |
| L, n 1. <SPID ₁ > . . n. <SPID _n > | |
| <i>Exception</i> | |
| If n = 0, there are no service programs. | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F13 Equipment Constant Request (ECR) | S,H->E,reply |
| <i>Description</i> | |
| Constants such as for calibration, servo gain, alarm limits, data collection mode, and other values that are changed infrequently can be obtained using this message. | |
| <i>Structure</i> | |
| The following structure is approved for all item formats and should be used by all new implementations: | |
| <pre> L,n 1. <ECID₁> . . n. <ECID_n> </pre> | |
| The following structure is included for compatibility with previous implementations and may only be used for items of format 3() and 5(): | |
| <pre> <ECID₁, . . . , ECID_n> </pre> | |
| <i>Exception</i> | |
| A zero-length list (structure1) or item (structure2) means report all ECVs according to a predefined order. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F14 Equipment Constant Data (ECD) | M,H<-E |
| <i>Description</i> | |
| Data Response to S2,F13 in the order requested. | |
| <i>Structure</i> | |
| <pre> L,n 1. <ECV₁> 2. <ECV₂> . . n. <ECV_n> </pre> | |
| <i>Exception</i> | |
| A zero-length list item for ECV _i means that ECID _i does not exist. The list format for this data item is not allowed, except in this case. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F15 New Equipment Constant Send (ECS) | S,H->E,reply |
| <i>Description</i> | |
| Change one or more equipment constants. | |
| <i>Structure</i> | |
| L, n 1. L, 2 1. <ECID ₁ > 2. <ECV ₁ > 2. L, 2 . . n. L, 2 1. <ECID _n > 2. <ECV _n > | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F16 New Equipment Constant Acknowledge (ECA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error If EAC contains a non-zero error code, the equipment should not change any of the ECIDs specified in S2F15. | |
| <i>Structure</i> | |
| <EAC> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F17 Date and Time Request (DTR) | S,H<->E,reply |
| <i>Description</i> | |
| Useful to check equipment time base or for equipment to synchronize with the host time base. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F18 Date and Time Data (DTD) | S,H<->E |
| <i>Description</i> | |
| Actual time data | |
| <i>Structure</i> | |
| <TIME> | |
| <i>Exception</i> | |
| A zero-length item means no time exists. | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F19 Reset/Initialize Send (RIS) | S,H->E,reply |
| <i>Description</i> | |
| Causes equipment to reach one of several predetermined initialized conditions. | |
| <i>Structure</i> | |
| <RIC> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F20 Reset Acknowledge (RIA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <RAC> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F21 Remote Command Send (RCS) | S,H->E,[reply] |
| <i>Description</i> | |
| Similar to pressing buttons on the front panel or causes some equipment activity to commence or to cease. | |
| <i>Structure</i> | |
| <RCMD> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F22 Remote Command Acknowledge (RCA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <CMDA> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F23 Trace Initialize Send (TIS) | M,H->E,reply |
| <i>Description</i> | |
| <p>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 S6,F1 and is related to the original request by the TRID Multiple trace requests may be made to that equipment allowing it. If equipment receives S2,F23 with the same TRID as a trace function that is currently in progress, the equipment should terminate the old trace and then initiate the new trace. A trace function currently in progress may be terminated by S2,F23 with TRID of that trace and TOTSMP = 0.</p> <p>If S2,F23 is multi-block, it must be preceded by the S2,F39/S2,F40 Inquire/Grant transaction. Some equipment may support only single-Block S6,F1, and may refuse a S2,F23 message which would cause a multi-block S6,F1.</p> <p>Each equipment shall document its trace performance limits. The Host Computer shall not send an S2,F23 which exceeds the equipment's performance limits, or the equipment may operate incorrectly.</p> | |
| <i>Structure</i> | |
| <p>The following structure is approved for all item formats and should be used by all new implementations:</p> <pre> L,5 1. <TRID> 2. <DSPER> 3. <TOTSMP> 4. <REPGSZ> 5. L,n 1. <SVID₁> . . n. <SVID_n> </pre> <p>The following structure is included for compatibility with previous implementations and may only be used for items whose SVID is format 3() and 5():</p> <pre> L,5 1. <TRID> 2. <DSPER> 3. <TOTSMP> 4. <REPGSZ> 5. <SVID₁, . . . , SVID_n> </pre> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F24 Trace Initialize Acknowledge (TIA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <TIAACK> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F25 Loopback Diagnostic Request (LDR) | S,H<->E,reply |
| <i>Description</i> | |
| A diagnostic message for checkout of protocol and communication circuits. The binary string sent is echoed back. | |
| <i>Structure</i> | |
| <ABS> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F26 Loopback Diagnostic Data (LDD) | S,H<->E |
| <i>Description</i> | |
| The echoed binary string | |
| <i>Structure</i> | |
| <ABS> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F27 Initiate Processing Request (IPR) | S,H->E,reply |
| <i>Description</i> | |
| Host requests equipment to initiate processing of the identified material at the specified location in the machine using the specified process program. | |
| <i>Structure</i> | |
| L, 3 1. <LOC> 2. <PPID> 3. L, n 1. <MID ₁ > . . n. <MID _n > | |
| <i>Exception</i> | |
| A zero-length PPID indicates no process program is being specified and the equipment is to take whatever action is appropriate for it to determine the proper program to use. A zero-length MID list indicates no MID is to be associated with the material to be processed. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F28 Initiate Processing Acknowledge (IPA) | S,H<-E |
| <i>Description</i> | |
| Response by equipment to Initiate Processing Request. Returned status indicates whether or not the request was honored by the equipment. | |
| <i>Structure</i> | |
| <CMDA> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F29 Equipment Constant Namelist Request (ECNR) | S,H->E,reply |
| <i>Description</i> | |
| This function allows the host to retrieve basic information about what equipment constants are available in the equipment. | |
| <i>Structure</i> | |
| L,n 1. <ECID ₁ > . . n. <ECID _n > | |
| <i>Exception</i> | |
| A zero-length list means send information for all ECIDs. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F30 Equipment Constant Namelist (ECN) | M,H<-E |
| <i>Description</i> | |
| Data Response | |
| <i>Structure</i> | |
| L,n (number of equipment constants) 1. L,6 1. <ECID ₁ > 2. <ECNAME ₁ > 3. <ECMIN ₁ > 4. <ECMAX ₁ > 5. <ECDEF ₁ > 6. <UNITS ₁ > 2. L,6 . . n. L,6 1. <ECID _n > 2. <ECNAME _n > 3. <ECMIN _n > 4. <ECMAX _n > 5. <ECDEF _n > 6. <UNITS _n > | |
| <i>Exception</i> | |
| Zero-length ASCII items for ECNAME _i , ECMIN _i , ECMAX _i , ECDEF _i , and UNITS _i indicates that the ECID does not exist. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F31 Date and Time Set Request (DTS) | S,H->E,reply |
| <i>Description</i> | |
| Useful to synchronize the equipment time with the host time base. | |
| <i>Structure</i> | |
| <TIME> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F32 Date and Time Set Acknowledge (DTA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge the receipt of time and date. | |
| <i>Structure</i> | |
| <TIACK> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F33 Define Report (DR) | M,H->E,reply |
| <i>Description</i> | |
| <p>The purpose of this message is for the host to define a group of reports for the equipment.</p> <p>The type of report to be transmitted is designated by a Boolean "Equipment Constant." An "Equipment Constant Value" of "False" means that an "Event Report"(S6,F11) will be sent, and a value of "True" means that an "Annotated Event Report"(S6,F13) will be sent.If S2,F33 is Multi-block, it must be preceded by the S2,F39/S2,F40 Inquire/Grant transaction.</p> | |
| <i>Structure</i> | |
| <pre> L, 2 1. <DATAID> 2. L,a # reports 1. L,2 report 1 1. <RPTID₁> 2. L,b # VIDs this report 1. <VID₁> . . b.<VID_b> a. L,2 report a 1. <RPTID_a> 2. L,c # VIDs this report 1. <VID₁> . . c. <VID_c> </pre> | |
| <i>Exception</i> | |
| <p>1. A list of zero-length following <DATAID> deletes all report definitions and associated links. See S2,F35 (Link Event/Report).</p> <p>2. A list of zero-length following <RPTID> deletes report type RPTID. All CEID links to this RPTID are also deleted.</p> | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F34 Define Report Acknowledge (DRA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error If an error condition is detected the entire message is rejected (i.e., partial changes are not allowed). | |
| <i>Structure</i> | |
| <DRACK> | |
| <i>Exception</i> | |
| None | |

| Stream,Function Name (Mnemonic) | Direction |
|---|--------------|
| S2,F35 Link Event Report (LER) | M,H->E,reply |
| <i>Description</i> | |
| 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. That is, the occurrence of an event would not cause the report to be sent until enabled. See S2,F37 for enabling reports. If S2,F35 is Multi-block, it must be preceded by the S2,F39/S2,F40 Inquire/Grant transaction. | |
| <i>Structure</i> | |
| <pre> L, 2 1. <DATAID> 2. L, a # events 1. L, 2 event 1 1. <CEID₁> 2. L, b 1. <RPTID₁> . . b. <RPTID_b> . . a. L, 2 event a 1. <CEID_a> # RPTIDS this event 2. L, c 1. <RPTID₁> . . c. <RPTID_c> </pre> | |
| <i>Exception</i> | |
| A list of zero length following CEID deletes all report links to that event. | |

| Stream,Function Name (Mnemonic) | Direction |
|--|-----------|
| S2,F36 Link Event Report Acknowledge (LERA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error If an error condition is detected the entire message is rejected (i.e., partial changes are not allowed). | |
| <i>Structure</i> | |
| <LRACK> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F37 Enable/Disable Event Report (EDER) | S,H->E,reply |
| <i>Description</i> | |
| The purpose of this message is for the host to enable or disable reporting for a group of events (CEIDs). | |
| <i>Structure</i> | |
| L, 2 1. <CEED> enable/disable 2. L, n #CEIDs 1. <CEID ₁ > . . n. <CEID _n > | |
| <i>Exception</i> | |
| A list of zero length following <CEED> means all CEIDs. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F38 Enable/Disable Event Report Acknowledge (EERA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error If an error condition is detected the entire message is rejected, i.e., partial changes are not allowed. | |
| <i>Structure</i> | |
| <ERACK> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F39 Multi-block Inquire (DMBI) | S,H->E,reply |
| <i>Description</i> | |
| If a S2,F23 S2,F33, S2,F35, S2,F45, or S2,F49 message is more than one block, this transaction must precede the message. | |
| <i>Structure</i> | |
| L, 2 1. <DATAID> 2. <DATALENGTH> | |
| <i>Exception</i> | |
| | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F40 Multi-block Grant (DMBG) | S,H<-E |
| <i>Description</i> | |
| Grant permission to send multi-block message. | |
| <i>Structure</i> | |
| <GRANT> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F41 Host Command Send (HCS) | S,H->E,reply |
| <i>Description</i> | |
| The Host requests the Equipment perform the specified remote command with the associated parameters. | |
| <i>Structure</i> | |
| L, 2 1. <RCMD> 2. L, n # of parameters 1. L, 2 1. <CPNAME ₁ > parameter 1 name 2. <CPVAL ₁ > parameter 1 value . . n. L, 2 1. <CPNAME _n > parameter n name 2. <CPVAL _n > parameter n value | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F42 Host Command Acknowledge (HCA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge Host command or error. If command is not accepted due to one or more invalid parameters (i.e., HCAACK = 3), then a list of invalid parameters will be returned containing the parameter name and reason for being invalid. | |
| <i>Structure</i> | |
| L, 2 1. <HCAACK> 2. L, n # of parameters 1. L, 2 1. <CPNAME ₁ > parameter 1 name 2. <CPACK ₁ > parameter 1 reason . . n. L, 2 1. <CPNAME _n > parameter n name 2. <CPACK _n > parameter n reason | |
| <i>Exception</i> | |
| If there are no invalid parameters, then a list of zero length will be sent for item 2. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F43 Reset Spooling Streams and Functions (RSSF) | S,H->E,reply |
| <i>Description</i> | |
| This message allows the host to select specific streams and functions to be spooled whenever spooling is active. | |
| <i>Structure</i> | |
| <pre> L,m 1. L,2 1. <STRID₁> 2. L,n 1. <FCNID₁> . . n. <FCNID_n> . . m. L,2 1. <STRID_m> 2. L,n 1. <FCNID₁> . . n. <FCNID_n> </pre> | |
| <i>Exception</i> | |
| <ol style="list-style-type: none"> 1. A zero-length list, m = 0, turns off spooling for all streams and functions. 2. A zero-length list, n = 0, turns on spooling for all functions for the associated stream. <p>Notes:</p> <ol style="list-style-type: none"> 1. Turning off spooling for all functions for a specific stream is achieved by omitting reference to the stream from this message. 2. Spooling for Stream 1 is not allowed. 3. Equipment must allow host to spool all primary messages for a stream (except Stream 1). 4. A defined list of functions for a stream in this message will replace any previously selected functions. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F44 Reset Spooling Acknowledge (RSA) | M,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| L, 2 1. <RSPACK> (accept or reject) 2. L, m (m = number of streams with errors) 1. L, 3 1. <STRID ₁ > 2. <STRACK ₁ > (error in stream) 3. L, n (n = number of functions in error) 1. <FCNID ₁ > . . n. <FCNID _n > . . m. L, 3 1. <STRID _m > 2. <STRACK _m > (error in stream) 3. L, n (n = number of functions in error) 1. <FCNID ₁ > . . n. <FCNID _n > | |
| <i>Exception</i> | |
| 1. If RSPACK = 0, a zero-length list, m = 0, is given, indicating no streams or functions in error. 2. A zero-length list, n = 0, indicates no functions in error for specified stream. | |

| Stream,Function Name (Mnemonic) | Direction |
|---|--------------|
| S2,F45 Define Variable Limit Attributes (DVLA) | M,H->E,reply |
| <i>Description</i> | |
| <i>Structure</i> | |
| <pre> L,2 1. <DATAID> 2. L,m (m = # of variables in this definition) 1. L,2 1. <VID₁> 2. L,n (n = # of limits being defined/changed for VID₁) 1. L,2 1. <LIMITID₁> 2. L,p (p = {0,2}) 1. <UPPERDB₁> 2. <LOWERDB₁> . . n. L,2 1. <LIMITID_n> 2. L,p (p = {0,2}) 1. <UPPERDB_n> 2. <LOWERDB_n> . . m.L,2 1. <VID_m> 2. L,n (n = # of limits being defined/changed for VID_m) 1. L,2 1. <LIMITID₁> 2. L,p (p = {0,2}) 1. <UPPERDB₁> 2. <LOWERDB₁> . . n. L,2 1. <LIMITID_n> 2. L,p (p = {0,2}) 1. <UPPERDB_n> 2. <LOWERDB_n> </pre> | |
| <i>Exception</i> | |
| 1. A zero-length list, m = 0, sets all limit values for all monitored VIDs to “undefined.” 2. A zero-length list, n = 0, sets all limits values for that VID to “undefined.” 3. A zero-length list, p = 0, sets that limit to “undefined.” | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F46 Variable Limit Attribute Acknowledge (VLAA) | M,H<-E |
| <i>Description</i> | |
| Acknowledge definition of variable limit attributes or report error. If DVLA is not accepted due to one or more invalid parameters (e.g., LIMITACK = 3), then a list of invalid parameters is returned containing the variable limit attribute and reason for rejection. If an error condition is detected, the entire message is rejected (i.e., partial changes are not allowed). | |
| <i>Structure</i> | |
| L, 2 1. <VLAACK> 2. L, m (m = number of invalid parameters) 1. L, 3 1. <VID ₁ > (VID with error) 2. <LVACK _p > (reason) 3. L, n {n = 0, 2} 1. <LIMITID ₁ > (1st limit in error for VID _p) 2. <LIMITACK ₁ > (reason) . . m. L, 3 1. <VID _m > (VID with error) 2. <LVACK _m > (reason) 3. L, n {n = 0, 2} 1. <LIMITID ₁ > (1st limit in error for VID _x) 2. <LIMITACK ₁ > (reason) | |
| <i>Exception</i> | |
| 1. A zero-length list, m = 0 indicates no invalid variable limit attributes. 2. A zero-length list, n = 0 indicates no invalid limit values for that VID. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S2,F47 Variable Limit Attribute Request (VLAR) | S,H->E,reply |
| <i>Description</i> | |
| This message allows the host to query the equipment for current variable limit attribute definitions. | |
| <i>Structure</i> | |
| L, m (m = # of VIDs this request) 1. <VID ₁ > . . m. <VID _m > | |
| <i>Exception</i> | |
| A zero-length list, m = 0, requests a list of all VID values that can have variable limit attributes. | |

| Stream,Function Name (Mnemonic) | Direction |
|---|-----------|
| S2,F48 Variable Limit Attributes Send (VLAS) | M,H<-E |
| <i>Description</i> | |
| Equipment sends values of requested variable limit attribute definitions in the order requested. | |
| <i>Structure</i> | |
| <pre> L,m (m = # of VIDs this request) 1. L,2 1. <VID₁> 2. L,p {p = 0,4} 1. <UNITS₁> 2. <LIMITMIN₁> 3. <LIMITMAX₁> 4. L,n (n = # of limits defined for this VID) 1. L,3 1. <LIMITID₁> 2. <UPPERDB₁> 3. <LOWERDB₁> . . n. L,3 1. <LIMITID_n> 2. <UPPERDB_n> 3. <LOWERDB_n> . . m. L,2 1. <VID_m> 2. L,p {p = 0,4} 1. <UNITS_m> 2. <LIMITMIN_m> 3. <LIMITMAX_m> 4. L,n (n = # of limits defined for this VID) 1. L,3 1. <LIMITID₁> 2. <UPPERDB₁> 3. <LOWERDB₁> . . n. L,3 1. <LIMITID_n> 2. <UPPERDB_n> 3. <LOWERDB_n> . . . </pre> | |
| <i>Exception</i> | |
| 1. A zero-length list, p = 0, indicates that limits are not supported for the VID. 2. A zero-length list, n = 0, means no limits are currently defined for the specified variable. | |

| Stream,Function Name (Mnemonic) | Direction |
|--|-----------|
| S2,F49 Enhanced Remote Command | M,H->E |
| Description | |
| The host requests an object to perform the specified remote command with its associated parameters. If multi-block, it shall be preceded by the S2,F39/S2,F40 Multi-Block Inquire/Grant transaction. | |
| Structure | |
| L, 4 1. <DATAID> 2. <OBJSPEC> 3. <RCMD> 4. L, m # of parameter groups 1. L, 2 1. <CPNAME ₁ > command parameter 1 name 2. <CEPVAL ₁ > command-enhanced parameter 1 value 2. L, 2 1. <CPNAME ₂ > command parameter 2 name 2. <CEPVAL ₂ > command-enhanced parameter 2 value . . m. L, 2 1. <CPNAME _m > command parameter m name 2. <CEPVAL _m > command enhanced parameter m value | |
| If a specific value of CPNAME is defined to have a CEPVAL defined as a LIST, it shall always be a LIST. If the CEPVAL that is associated to that specific value of CPNAME is defined to be anything other than LIST, it will result in a format error. | |
| Exception | |
| A zero length list, m = 0, indicates that no parameter groups are sent with the command. OBJSPEC can be a null length item. | |
| Notes: 1. If CEPVAL is a LIST, the items that make up that list shall take on one of the following forms: (1) a list of items with an identical format, (2) a LIST of CPNAME, CEPVAL pairs, as illustrated below. | |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> A) L, 2 1. <CPNAME_a> 2. L, m 1. <CPVAL_{a1}> 2. <CPVAL_{a2}> . . m. <CPVAL_{am}> </div> <div style="width: 45%;"> B) L, 2 1. <CPNAME_b> 2. L, n 1. L, 2 1. <CPNAME_{b1}> 2. <CEPVAL_{b1}> . . n. L, 2 1. <CPNAME_{bn}> 2. <CEPVAL_{bn}> </div> </div> | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S2,F50 Enhanced Remote Command Acknowledge | M,H<-E |
| <i>Description</i> | |
| The equipment acknowledges Enhanced Remote Command or reports any error(s). If the command is not accepted due to one or more invalid parameters, (i.e. HCACK = 3), then a list of invalid parameters will be returned containing the parameter name and reason for being invalid. | |
| <i>Structure</i> | |
| L, 2 1. <HCACK> 2. L, n # of parameter groups 1. L, 2 1. <CPNAME ₁ > 2. <CEPACK ₁ > . . n. L, 2 1. <CPNAME _n > 2. <CEPACK _n > | |
| <i>Exception</i> | |
| None | |

10.7 *Stream 3 Materials Status* — The functions of the material status stream are used to communicate information and actions related to material, including carriers and material-in-process, time-to-completion information, and extraordinary material occurrences.

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F0 Abort Transaction (S3F0) | S,H<->E |
| <i>Description</i> | |
| Same form as S1,F0 | |
| <i>Structure</i> | |
| | |
| <i>Exception</i> | |
| | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F1 Material Status Request (MSR) | S,H->E,reply |
| <i>Description</i> | |
| Host requests the device to send the status of all material in process. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F2 Material Status Data (MSD) | M,H<-E |
| <i>Description</i> | |
| Material-in-process information is sent from the equipment to the host. There are m locations. | |
| <i>Structure</i> | |
| L, 2 1. <MF> 2. L, m 1. L, 3 1. <LOC ₁ > 2. <QUA ₁ > 3. <MID ₁ > 2. L, 3 . . m. L, 3 1. <LOC _m > 2. <QUA _m > 3. <MID _m > | |
| <i>Exception</i> | |
| A zero-length list returned means no such data exists. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F3 Time to Completion Request (TCR) | S,H->E,reply |
| <i>Description</i> | |
| Host requests the equipment to send the time-to-completion of operations on all material in possession. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F4 Time to Completion Data (TCD) | M,H<-E |
| <i>Description</i> | |
| Time-to-completion information is sent by the equipment to the host. | |
| <i>Structure</i> | |
| L, 2 1. <MF> 2. L, m 1. L, 3 1. <TTC ₁ > 2. <QUA ₁ > 3. <MID ₁ > 2. L, 3 . . m. L, 3 1. <TTC _m > 2. <QUA _m > 3. <MID _m > | |
| <i>Exception</i> | |
| A zero-length list header returned means no such data exists. | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F5 Material Found Send (MFS) | S,H<-E,[reply] |
| <i>Description</i> | |
| The equipment advises the host that unsolicited material has appeared at one of its sensors. | |
| <i>Structure</i> | |
| L, 2 1. <MF> 2. <QUA> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F6 Material Found Acknowledge (MFA) | S,H->E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <ACKC3> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F7 Material Lost Send (MLS) | S,H<-E,[reply] |
| <i>Description</i> | |
| The equipment advises the host that material has disappeared from its sensors. | |
| <i>Structure</i> | |
| L, 3 1. <MF> 2. <QUA> 3. <MID> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F8 Material Lost Acknowledge (MLA) | S,H->E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <ACKC3> | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F9 Material ID Equate Send (IES) | S,H<-E,reply |
| <i>Description</i> | |
| Provide an alternative name to be used as equivalent to the original material ID. | |
| <i>Structure</i> | |
| L, 2 1. <MID> 2. <EMID> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F10 Material ID Equate Acknowledge (IEA) | S,H->E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <ACKC3> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F11 Material ID Request (MIDR) | S,H<-E,reply |
| <i>Description</i> | |
| The equipment requests the Material ID of the material at the specified port. | |
| <i>Structure</i> | |
| <PTN> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F12 Material ID Request Acknowledge (MIRA) | S,H->E |
| <i>Description</i> | |
| The host acknowledges the request for the Material ID. If the use of a request/acknowledge/send/acknowledge conversation is required, it indicated by the acknowledge code MIDRA = 2. In this case, the send/acknowledge transaction is S3,F13, S3,F14. A timeout when electing S3,F13 is indicated by S9,F13 or a restart of the conversation, with S3,F11. | |
| <i>Structure</i> | |
| L, 3 1. <PTN> 2. <MIDRA> 3. <MID> | |
| Note: For all cases except MIDRA = 0 (accepted, <MID> follows), the <MID> will be ignored by the receiver of message S3,F12. When MIDRA = 0, a zero-length MID indicates that no MID is available. | |
| <i>Exception</i> | |
| None | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F13 Material ID Send (MIS) | S,H->E,reply |
| <i>Description</i> | |
| The host sends the Material ID of the material at the specified port. | |
| <i>Structure</i> | |
| L, 2 1. <PTN> 2. <MID> | |
| Note: A zero-length MID indicates that no MID is available. | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F14 Material ID Acknowledge (MIA) | S,H<-E |
| <i>Description</i> | |
| Acknowledge or error | |
| <i>Structure</i> | |
| <MIDAC> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F15 Materials Multi-Block Inquire (MMBI) | S,H->E,reply |
| <i>Description</i> | |
| This message requests permission to send a multi-block message based upon a maximum length of the total message. It must be sent prior to sending any multi-block primary message in Stream 3. | |
| <i>Structure</i> | |
| L, 2 1. <DATAID> 2. <DATALENGTH> | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F16 Materials Multi-Block Grant (MMBG) | S,H<-E |
| <i>Description</i> | |
| This message grants or denies permission to send a multi-block primary message in Stream 3. | |
| <i>Structure</i> | |
| <GRANT> | |
| <i>Exception</i> | |
| None | |



| | |
|--|------------------|
| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
| S3,F17 Carrier Action Request | M,H->E,reply |
| <i>Description</i> | |
| This message requests an action to be performed for a specified carrier. If multi-block, this message must be preceded by the S3,F11/F12 transaction. | |
| <i>Structure</i> | |
| <pre> L, 5 1. <DATAID> 2. <CARRIERACTION> 3. <CARRIERID> 4. <PTN> 5. L, n n = number of carrier attributes 1. L, 2 1. <CATTRID₁> 2. <CATTRDATA₁> . . n. L, 2 1. <CATTRID_n> 2. <CATTRDATA_n> </pre> | |
| <i>Exception</i> | |
| <p>If n = 0, then no carrier attributes are included. If CARRIERID is not a zero-length item, then PTN may be omitted (a zero-length item). ATTRID and ATTRDATA may be substituted for CATTRID and CATTRDATA respectively.</p> <p>ReticlePodLocationID may be used as one of <CATTRID> when the CARRIERACTION is PodRelease and the carrier is not at a Load Port.</p> | |

| | |
|--|------------------|
| <i>Stream, Function Name (Mnemonic)</i> | <i>Direction</i> |
| S3,F18 Carrier Action Acknowledge | S,H<-E |
| <i>Description</i> | |
| This message acknowledges the carrier action request. | |
| <i>Structure</i> | |
| <pre> L, 2 1. <CAACK> 2. L, n 1. L, 2 1. <ERRCODE₁> 2. <ERRTEXT₁> . . n. L, 2 1. <ERRCODE_n> 2. <ERRTEXT_n> </pre> | |
| <i>Exception</i> | |
| If n = 0, no errors exist. | |



| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F19 Cancel All Carrier Out Request | S,H->E, reply |
| <i>Description</i> | |
| This message is used to cancel all pending carrier out requests. | |
| <i>Structure</i> | |
| Header only | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F20 Cancel All Carrier Out Acknowledge | S,H<-E |
| <i>Description</i> | |
| This message acknowledges the Cancel Carrier Out request. | |
| <i>Structure</i> | |
| L, 2 1. <CAACK> 2. L, n 1. L, 2 1. <ERRCODE ₁ > 2. <ERRTEXT ₁ > . . n. L, 2 1. <ERRCODE _n > 2. <ERRTEXT _n > | |
| <i>Exception</i> | |
| If n = 0, no errors exist. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|--|------------------|
| S3,F21 Port Group Definition | S,H->E, reply |
| <i>Description</i> | |
| This message defines the port in a port group and provides the initial port access. | |
| <i>Structure</i> | |
| L, 3 1. <PORTGRPNAME> 2. <PORTACCESS> 3. L, n 1. <PTN ₁ > . . n. <PTN _n > | |
| <i>Exception</i> | |
| None | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F22 Port Group Definition Acknowledge | S,H<-E |
| <i>Description</i> | |
| This message acknowledges the port group definition | |
| <i>Structure</i> | |
| L, 2 1. <CAACK> 2. L, n 1. L, 2 1. <ERRCODE ₁ > 2. <ERRTEXT ₁ > . . n. L, 2 1. <ERRCODE _n > 2. <ERRTEXT _n > | |
| <i>Exception</i> | |
| If n = 0, no errors exist. | |

| <i>Stream,Function Name (Mnemonic)</i> | <i>Direction</i> |
|---|------------------|
| S3,F23 Port Group Action Request | S,H->E, reply |
| <i>Description</i> | |
| This message requests an action be performed for a port group. The access mode may be changed or the port group may be deleted. | |
| <i>Structure</i> | |
| L, 3 1. <PGRP ACTION> 2. <PORTGRPNAME> 3. L, m 1. L, 2 1. <PARAMNAME ₁ > 2. <PARAMVAL ₁ > . . m. L, 2 1. <PARAMNAME _m > 2. <PARAMVAL _m > | |
| <i>Exception</i> | |
| If m = 0, then no parameters are provided. | |