SECS/GEM DOCUMENTATION

FOR EQUIPMENT: SPI, AOI

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VERSION : 2.0

RELEASED ON: 2019-05-02

REVISION HISTORY

Date	Version	Revision	Writer	BRM ver	Comments
02-May-19	Ver 2.0	0.9	sw, kim	2.5.9.6	Initial draft (Beta version)
02-May-19					

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1 INTRODUCTION

1.1 Purpose

This document describes the GEM compliant SECS-II interface for the mentioned equipment. It includes the information required by the SECS-II and GEM standards including the GEM Compliance Statement, GEM State Models, SECS-II Message Documentation, and other interface details.

1.2 Manufacturer

1.3 Equipment

This documentation describes the GEM interface for the following products.

Model	Version	Product Number	General Description
SPI			
AOI			

1.4 Intended Function of the Interface

1.5 Changes From Previous Version

1.6 References

Standard	Name	Acronym
SEMI E30	Generic Model for Communication and Control of SEMI Equipment	GEM
SEMI E5	SEMI Equipment Communications Standard 2 Message Content	SECS-II
SEMI E4	SEMI Equipment Communications Standard 1 Message Transfer	SECS-I
SEMI E37	High Speed Message Service-Single Session	HSMS-SS

For more information about SEMI or the standards produced by SEMI, contact SEMI by one of the following references.

http://www.semi.org/

1.7   *Definitions, acronyms, abbreviations, and symbols*

1.7.1   **Data Item Formats**

Abbreviation	SM L	Description
A	A[length] or A[min, max]	ASCII
Bi	B	Binary
Bo	BOOLEAN	Boolean
F4	F4	4-byte floating point
F8	F8	8-byte floating point
J	J[length] or J[min, max]	JIS-8, Japanese international standard
L	L[length]	List
I1	I1	1-byte signed integer
I2	I2	2-byte signed integer
I4	I4	4-byte signed integer
I8	I8	8-byte signed integer
U1	U1	1-byte unsigned integer
U2	U2	2-byte unsigned integer
U4	U4	4-byte unsigned integer
U8	U8	8-byte unsigned integer

1.7.2   **Definitions**

Alarm	An alarm is related to any abnormal situation on the equipment that may endanger people, equipment, or material being processed. Alarm notification may be disabled or enabled. Each alarm is always either set or clear.
Capability	Capabilities are operations performed by semiconductor manufacturing equipment. These operations are initiated through the communications interface using sequences of SECS-II messages.
Collection Event	A collection event is an event (or grouping of related events) on the equipment that is considered significant to the host. Event notification may be disabled or enabled as desired. Data reports may be linked to events.
Communication Failure	A communication failure is said to occur when an established communications link is broken. In a SECS-I environment, this occurs when the protocol retry-limit (RTY) is exceeded.
Communication Fault	A communication fault occurs when the equipment does not receive an expected message, or when either a transaction timer or a conversation timer expires.
Data Variable	Information directly related to a collection event. The value is only guaranteed to be valid when included in a report linked to a valid collection event. A list of valid collection events is included in the data variable's description in this manual.
Equipment Constant	A machine setting. The host or local operator may set the value.
Event Report	One or more reports linked to a collection event. The data in the report is sent in the same SECS-II message as the collection event notification.
Generic Equipment Model	This is used as a reference model for any type of equipment. It contains functionality that can apply to most equipment, but does not address unique requirements of specific equipment.
GEM	Generic Model for Communications and Control of SEMI Equipment. SEMI E30. A standard implementation of the SECS-II standard defining a common set of equipment behavior and communications capabilities.
Harel Notation	The use of state charts that show traditional state-transition diagrams with several additional concepts such as hierarchy and concurrent. See the Harel Notation heading in section 1.7.3 for more information.
HSMS	High Speed Message Service. SEMI E37. This standard defines TCP/IP based communication as an alternative to SECS-I (serial) communication. There are two modes of this standard, HSMS-SS (single session) and HSMS-GS (general session).
Host	The SEMI E4 and E5 standards define Host as "the intelligent system that communicates with the equipment."
Message Fault	A message fault occurs when the equipment receives a message that it cannot process because of a defect in the message.

Operator	A human who operates the equipment in order to perform its intended function (e.g. processing). The operator typically interacts with the equipment via the equipment supplied operator console.
Processing Cycle	A processing cycle is a sequence wherein all of the material contained in a typical process unit is processed. This is often used as a measure of action or time.
Recipe	A file of equipment processing instructions. The instructions tell the equipment what to do and how to do it. Recipes are also called process programs.
Report	List of status variables, data variables, and equipment constants. An ID number identifies it uniquely.
Scenario	A scenario is a group of SECS-II messages arranged in a sequence to perform a capability. Other information may also be included in a scenario for clarity.
SECS-I	SEMI Equipment Communications Standard 1; SEMI E4. This standard specifies a method for a message transfer protocol with electrical signal levels based upon EIA RS232-C.
SECS-II	SEMI Equipment Communications Standard 2; SEMI E5. This standard specifies a group of messages and the respective syntax and semantics for those messages relating to semiconductor manufacturing equipment control.
SECS-II message	The host and equipment communicate by sending each other SECS-II messages. A stream number, function number, and message body describe a SECS-II message.
SEMI	Semiconductor Equipment and Materials International. See www.semi.org for more information.
State Model	A State Model is a collection of states and state transitions that combine to describe the behavior of a system. This model includes a definition of the conditions that delineate a state, the actions/reactions possible within a state, the events that trigger transitions to other states, and the process of transitioning between states.
Status Variable	Information about the status of the machine. The value is always valid.
System Default	Refers to state(s) in the equipment behavioral model that are expected to be active at the end of system initialization. It also refers to the value(s) that specified equipment variables are expected to contain at the end of system initialization.
System Initialization	The process that equipment performs at power-up, system activation, and/or system reset. This process is expected to prepare the equipment to operate properly and according to the equipment behavioral models.
Trace	List of status variables polled and sent to the host at a defined frequency. An ID number identifies it uniquely.
Unit	Unit identifier defined in the SECS-II standard.
Variable Type	One of the types defined by the SECS-II standard.

1.7.3   Harel Notation

In GEM, proper state machine Harel Notation requires a state diagram, state definitions, and a transition table.

1.7.3.1   State-Transition Diagrams

Harel's statecharts extend traditional state-transition diagrams with several additional concepts, most important of which are hierarchy and concurrence. Statecharts depict the behavior of a system by showing possible states, events that prompt a change of state, and the composition of states. The symbols are then listed and explained. See the figure below for the basic notational symbols.

a) State   b) Transition   c) Default Entry Point

d) History   e) Selector   f) Conditional Selector
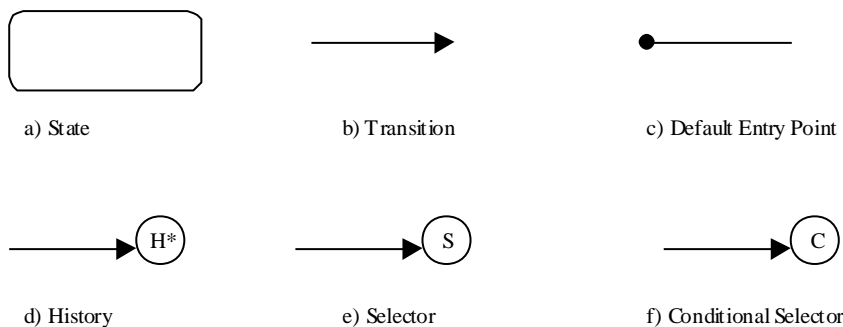
Rounded boxes represent states. A state transition is shown graphically with a line from the old state terminating with

the arrow symbol at the new state. Transitions are unidirectional -- while the reverse transition may be possible, it is considered a different transition with different conditions for initiation and different resultant actions.

States may be subdivided into substates to define more concise behavior. Thus, a hierarchy is defined whereby any state may be a substate of some parent state and in turn be the parent of its own substates. Substates must be one of two types, termed AND substates and OR substates.

A parent may be divided into two or more OR substates of which one and only one is the active substate at any time. The accepted term for this exclusivity is XOR. For example, some system (perhaps a motor) has a state named FUNCTIONAL. When the motor is FUNCTIONAL, it may be either ON or OFF, but never both.

Another way of dividing a parent state corresponds roughly to subsystems. These AND substates represent parallelism, such that every AND substate of an active parent state is considered active. Harel also uses the term "Orthogonal Component" to refer to AND substates. However, these parallel substates tend to be highly interactive and interdependent. For this reason, the word orthogonal is considered confusing and has been excluded from use in this document. Figure A.5.3, in the SEMI E30 manual, shows an example of AND substates representing (in part) an automobile. Note the convention of attaching the name of the parent's state AUTOMOBILE to the outside of the state in a small box. The substates shown are independent components and may have their own substates (of either the "AND" or "OR" type):

- LIGHTS may be ON or OFF;

- DOOR may be OPEN or CLOSED;

- ENGINE is constructed of components such as pumps, pistons, carburetor, etc.

Exiting one of a set of AND substates requires the exit of all others. In some cases, a transition arrow will be shown from only one of the substates with the others implied.

A simplification that also helps to prevent in determinacy is implemented with the symbol for default entry point. This symbol will indicate which OR substate is initially active when there is not an explicit choice. A transition arrow from one state to another that does not cross the boundary of the parent to point specifically to a substate indicates this lack of specification.

An entrance to a state terminating in a history symbol indicates that the "OR" substate to be entered should be that which was active the last time the parent state was active. For example, the last time the car was running the radio was on. The history symbol H refers to the choice of substates of the parent. The symbol H* extends further to the lowest level substates defined. In the absence of memory of a "last time", the default entry is used.

The selector and conditional selector symbols serve to abbreviate complex entrances to states. The meaning is similar and indicates that the choice of OR substate upon entry of a parent state depends on some condition that is not shown. The selector is usually used to combine several similar transition events, while the conditional selector will typically require some computation or test of condition external to the stimulus for state transition. Please examine the referenced article for more detail.

NOTE: Within the body of this document, the term statechart is not used in favor of the more traditional term state diagram.

1.7.3.2   State Definitions

The state diagram provides a concise description of the function of a system. However, a full definition requires detail that cannot be included on the diagram. A description of each state is required that covers the boundaries of the state and any responses that occur within that state to the environment. The convention in this document is to provide state names in ALL CAPS to help the reader identify where these are used. A sample state description of the "ON" state might be:

ON

The switch is in the on position. Power is available to the motor. Speed of the motor will change in proportion to the speed knob adjustment.

1.7.3.3   Transition Table

The last piece of the state model is the transition table. It consists of several columns that list the transition number from the diagram, the starting and ending state for the transition, and three columns titled trigger, action, and comment. The trigger column describes the combination of events and conditions that initiates the transition (e.g. Sx, Fy message received). The trigger should be related to a single clearly defined event at the equipment. The action column identifies the activities associated directly with the transition. These activities may be of three types: a) actions taken upon exit of the old state, b) actions taken upon entry to the new state, and c) actions not associated with either state. These are not differentiated in this document. The final column allows for additional comments that help to clarify the transition. Table A.5, an example of a transition table, illustrates the motor example in Figure A.5.2 (shown in the SEMI E30 manual).

Table A.5. Transition Table for Motor Example

#	Current State	Trigger	New State	Action	Comment
1	OFF	Switch turned to on position	ON	Power supplied to motor.	Power supply assumed available. Motor begins to turn.
2	ON	Switch turned to off position.	OFF	Power supply to motor disconnected.	Motor begins deceleration.

2   GEM COMPLIANCE STATEMENT

Fundamental GEM Requirements	Implemented	GEM Compliant
State Models	Yes	
Equipment Processing States	Yes	
Host-Initiated S1, F13/14 Scenario	Yes	
Event Notification	Yes	Yes
On-line Identification	Yes	
Error Messages	Yes	
Documentation	Yes	
Control (Operator) Initiated	Yes	

Additional Capabilities	Implemented	GEM Compliant
Establish Communications	Yes	Yes
Dynamic Event Report Configuration	Yes	Yes
Data Variable and Collection Event Namelist Requests	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	Yes
Material Movement	Yes	Yes
Equipment Terminal Services	Yes	Yes
Clock	Yes	Yes
Limits Monitoring	No	Yes
Spooling	Yes	Yes
Control (Host-Initiated)	Yes	Yes

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3   STATE MODELS

The following sections contain state models for semiconductor manufacturing equipment. These state models describe the behavior of the equipment from a host. GEM requires each state model to be documented with a state diagram, a transition table and a definition of each system behavior when that state is active. Multiple host equipment must have the same documented models for each host.

3.1   Communications

3.1.1   General Description

The Communications State Model defines the behavior of the equipment in relation to the existence or absence of a communications link with the host. Two major states of SECS communication protocols are DISABLED and ENABLED. The ENABLED state has two sub-states, NOT COMMUNICATING and COMMUNICATING.

3.1.2   Communications State Diagram

3.1.3   State Definitions

3.1.3.1   DISABLED

The equipment does not desire SECS-II communication with a host computer. If the operator switches from ENABLED to DISABLED, all SECS-II communications will cease immediately. Any unsent messages are discarded. All further actions on any open transactions and conversations are terminated. Refer to SEMI E5 for definitions of SECS-II transaction and conversation protocols. The DISABLED State may be the system default.

3.1.3.2   ENABLED

The equipment desires SECS-II communication with a host computer. ENABLED has two sub-states, COMMUNICATING and NOT COMMUNICATING. Whenever communications are enabled, either during system initialization or through operator selection, the sub-state of NOT COMMUNICATING is active until communications are formally established. Lower-level protocols (such as SECS-I or HSMS-SS) are assumed to be functioning normally in that they are capable of supporting the communication of SECS-II syntax. The ENABLED State may be the system default.

3.1.3.3   NOT COMMUNICATING

Only messages S1, F13, S1, F14, and Stream 9 are sent while this sub-state is active. The equipment discards any messages received from the host other than S1, F13 or S1, F14. The equipment will periodically attempt to establish

communication with the host computer by issuing an S1, F13 until communications are successfully established. Only one equipment-initiated S1, F13 transaction is open at any time.

The NOT COMMUNICATING state has two sub-states, HOST-INITIATED CONNECT and EQUIPMENT-INITIATED CONNECT. Both are active whenever the equipment is NOT COMMUNICATING. These sub-states clarify the behavior of the equipment in the event that both the equipment and the host attempt to establish communications during the same period of time. Note that in the Harel notation, an exit from any sub-state is an exit from the parent state and thus from all other sub-states of that parent sub-state.

3.1.3.4   EQUIPMENT-INITIATED CONNECT

This state has two sub-states, WAIT CRA and WAIT DELAY. Upon any entry to the NOT COMMUNICATING State, whenever EQUIPMENT-INITIATED CONNECT first becomes active, a transition to WAIT CRA occurs. The CommDelay timer is then set to "expired," and an immediate attempt to send S1, F13 is made.

3.1.3.5   WAIT CRA

An establish-communications request has been sent. The equipment waits for the host to acknowledge the request.

3.1.3.6   WAIT DELAY

A connection-transaction failure has occurred. The CommDelay timer has been initialized. The equipment waits for the timer to expire.

3.1.3.7   HOST-INITIATED CONNECT

This state describes the behavior of the equipment in response to a host-initiated S1, F13 while NOT COMMUNICATING is active.

3.1.3.8   WAIT CR FROM HOST

This is a sub state of HOST-INITIATED CONNECT. The equipment waits for an S1, F13 from the host. If an S1, F13 is received, the equipment attempts to send an S1, F14 with COMMACK = 0.

3.1.3.9   COMMUNICATING

Communications have been established between the equipment and host. The equipment may receive any message from the host, including S1, F13. When the equipment is COMMUNICATING, SECS communications with a host computer must be maintained. This state remains active until communications are disabled or a communication failure occurs. If the equipment receives S1, F13 from the host while in the COMMUNICATING sub-state, it should respond with S1, F14 with COMMACK set to zero. If the equipment receives S1, F14 from a previously sent S1, F13, no action is required.

In case of communication failure, the equipment returns to the NOT COMMUNICATING sub-state and attempts to re-establish communications with the host.

It is possible that the equipment will be waiting for an S1, F14 from the host in EQUIPMENT-INITIATED CONNECT/WAIT CRA when an S1, F13 is received from the host in HOST-INITIATED CONNECT/WAIT CR FROM HOST. When this situation occurs, both equipment and host have an open S1, F13/S1, F14 transaction. Since communications are successfully established on the favorable completion of any S1, F13/S1, F14 transaction, either of these two transactions may be the first to complete successfully and to cause the transition from NOT COMMUNICATING to COMMUNICATING. In this event, the other transaction remains open regardless of the transition to COMMUNICATING until it is closed in a normal manner.

If the equipment has not yet sent an S1, F14 to a previously received S1, F13 at the time when COMMUNICATING becomes active, the S1, F14 response is sent in a normal manner. This includes transmissions that may have started but not yet successfully completed at the time that the transition to COMMUNICATING occurs. A failure to send the S1, F14 is then treated as any other communication failure.

If the equipment-initiated S1, F13/S1, F14 transaction is still open when the transition to COMMUNICATING occurs, then a subsequent failure to receive a reply from the host is considered a communication fault by equipment. An S9, F9 is sent when a transaction timer timeout occurs.

3.1.4   State Transition Table

#	Current State	Trigger	New State	Action	Comment
1	(Entry to COMMUNICATIONS)	System initialization	System Default	None	The system default may be set to DISABLED OR ENABLED.
2	DISABLED	Operator switches from DISABLED to ENABLED	ENABLED	None	SECS-II communications are enabled.

3	ENABLED	Operator switches from ENABLED to DISABLED	DISABLED	None	SECS-II communications are prohibited.
4	(Entry to ENABLED)	Any entry to ENABLED state.	NOT COMMUNICATING	None	May enter from system initialization to ENABLED or through operator switch to ENABLED.
5	(Entry to EQUIPMENT-INITITATED CONNECT)	(Any entry to NOT COMMUNICATING)	WIAT CRA	Initialize communications. Set CommDelay timer "expired." Send S1, F13	Begin the attempt to establish communications.
6	WAIT CRA	Connection transaction failure.	WAIT DELAY	Initialize CommDelay timer.	Wait for timer to expire.
7	WAIT DELAY	CommDelay timer expired	WAIT CRA	Send S1, F13	Wait for S1, F14. May receive S1, F13 from Host.
8	WAIT DELAY	Received a message other than S1, F13	WAIT CRA	Discard message. No reply. Set CommDelay timer "expired". Send S1, F13.	Indicates opportunity to establish communications.
9	WAIT CRA	Received expected S1, F14 with COMMACK=0	COMMUNICATING	None.	Communications established.
10	(Entry to HOST-INITIATED CONNECT)	(Any entry to NOT COMMUNICATING)	WAIT CR FROM HOST	None.	Wait for S1, F13 from Host.
14	COMMUNCATING	Communication failure	NOT COMMUNICATING	Dequeue all messages queued to send.	Dequeued messages may be placed in spool buffer as appropriate.
15	WAIT CR FROM HOST	Received S1,F13	COMMUNICATING	Send S1,F14 with COMMACK = 0	Communications are established.

3.1.5   Related Variables, Constants and Events

For complete descriptions, refer to the Appendix.

Name	Type
EstablishCommunicationsTimeout	Equipment Constant
DefaultCommState	Equipment Constant
CommState	Status Variable
CommEnableSwitch	Status Variable

3.2   Control

3.2.1   General Description

The Control State Model defines the level of cooperation between the host and equipment. This model also specifies how the operator may interact at the different levels of host control and defines the equipment's responsibility to act upon messages that it receives. Three levels of control exist. The highest level, REMOTE, allows the host to control the equipment to the full extent possible. The middle level, LOCAL, allows the host to access all information, but places some limitations on how the host may control equipment operation. The lowest level, OFF-LINE, allows no host control and no access.

3.2.2   Control State Diagram
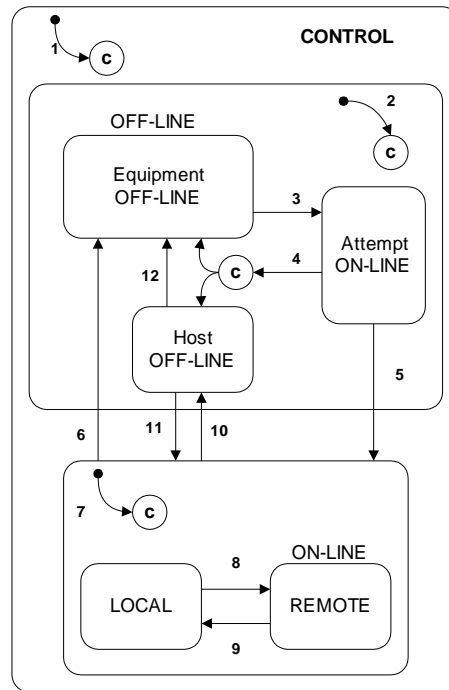
3.2.3   Control State Definitions

3.2.3.1   OFF-LINE

When the OFF-LINE State is active, the operator at the operator console only performs operation of the equipment. Message transfer is severely restricted. The equipment will respond with an Sx, F0 to any primary message from the host other than S1, F13 or S1, F17. It will process and respond to S1, F13 (establishment of communications) and S1, F17 (host request to activate the ON-LINE State). The equipment will accept the S1, F17 and send a positive response only when the HOST OFF-LINE state is active (see transition 11 in the Control State Transition Table).

While the OFF-LINE State is active, the equipment will not send any primary messages other than S1, F13, S9, Fx, and S1, F1 (see ATTEMPT ON-LINE sub-state). Sending of S1, F13 is based upon the COMMUNICATIONS State Model. S9, Fx messages is issued only in response to the messages to which the equipment will normally respond while OFF-LINE (i.e., S1, F13 and S1, F17). If the equipment receives a reply message from the host other than S1, F14 or S1, F2, this message is discarded.

No messages enter the spool when the system is OFF-LINE. Spooling may be active when the Communications State of NOT COMMUNICATING is active. This might occur during OFF-LINE, but since the equipment will not attempt to send messages except as mentioned in the previous paragraph, no messages will enter the spool. The equipment may send S1, F1 or S1, F13, but since Stream 1 messages are not eligible for spooling, they will not enter the spool.

OFF-LINE has three sub-states: EQUIPMENT OFF-LINE, ATTEMPT ON-LINE, and HOST OFF-LINE.

3.2.3.2   EQUIPMENT OFF-LINE

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

3.2.3.3   ATTEMPT ON-LINE

While the ATTEMPT ON-LINE State is active, the equipment has responded to an operator instruction to attempt to go to the ON-LINE State. Upon activating this state, the equipment attempts to send an S1, F1 to the host. Note that when this state is active, the system does not respond to operator actuation of either the ON-LINE or the OFF-LINE switch.

3.2.3.4   HOST OFF-LINE

While the HOST OFF-LINE state is active, the operator's intent is that the equipment be ON-LINE. However, the host has not agreed. Entry to this state may be due to a failed attempt to go ON-LINE or to the host's request that the equipment go OFF-LINE from ON-LINE (see the Control State Transition Table for more detail). While this state is active, the equipment positively responds to any host's request to go ON-LINE (S1, F17). Such a request is denied when the HOST OFF-LINE State is not active.

3.2.3.5   ON-LINE

While the ON-LINE State is active, SECS-II messages may be exchanged and active. Capabilities available to the host are similar to those available from the operator console wherever practical. The equipment may go ON-LINE only when the Communication State is COMMUNICATING.

3.2.3.6   LOCAL

Operation of the equipment is implemented by direct action of an operator. All operation commands are available for input at the local operator console of the equipment.

The host has the following capabilities and restrictions when the LOCAL State is active:

- During processing, the host may be prohibited from modifying equipment constants that affect that process. Other equipment constants are changeable during processing. The host may modify all available equipment constants when no processing is in progress.

- The host is prohibited from the use of remote commands.

- The host may initiate the upload and download of recipes to or from the recipe storage area on the equipment unless it affects the current recipe during processing.

- The host may configure automatic data reporting capabilities including alarms, event reporting, and trace data reporting. The host receives all such reports at the appropriate times.

- The host may inquire for data from the equipment, including status data, equipment constants, event reports, process program directories, and alarms.

- The equipment may perform Terminal Services.

The host is allowed any other capabilities that were not specifically restricted in the above items as long as the LOCAL State is active.

Note: Capabilities mentioned above which are not implemented on a specific equipment may be ignored in this context.

3.2.3.7   REMOTE

While the REMOTE State is active, the host may operate the equipment through the communications interface. All functionality allowed during the LOCAL State is also allowed in the REMOTE State. The equipment does not restrict any host capabilities when REMOTE is active. The host may issue remote commands according to each command's availability. No capabilities that are available to the operator during LOCAL control are unconditionally restricted when the REMOTE State is active.

Control is shared between the host and the local operator. At the very least, the operator may change the CONTROL State, actuate an Emergency Stop, and interrupt processing. The host software should be designed to be compatible with the capabilities allotted to the operator.

Remote commands are listed and described in the Appendix.

3.2.4   Control State Transition Table

#	Current State	Trigger	New State	Action	Comments
1	(Undefined)	Entry into CONTROL state (system initialization)	CONTROL (Substate conditional on configuration).	None	Equipment may be configured to default to ON-LINE or OFF-LINE.
2	(Undefined)	Entry into OFF_LINE state	OFF_LINE (Substate conditional on configuration).	None	Equipment may be configured to default to any substate of OFF-LINE.
3	EQUIPMEN OFF-LINE	Operator actuates ON-LINE switch.	ATTEMPT ON-LINE	None	Note that an S1, F1 is sent whenever ATTEMPT ON-LINE is activated.
4	ATTEMPT ON-LINE	S1, F0	New state conditional on configuration.	None	This may be due to a communication failure, reply timeout, or receipt of S1, F0. Configuration may be set to EQUIPMENT OFF-LINE or HOST OFF-LINE.
5	ATTEMPT ON-LINE	Equipment receives expected S1, F2 message from the host.	ON-LINE	None	Host is notified of transition to ON-LINE at transition 7.

6	ON-LINE	Operator actuates OFF-LINE switch.	EQUIPMENT OFF-LINE	None	"Equipment OFF-LINE" event occurs. Event reply will be discarded while OFF-LINE is active.
7	(Undefined)	Entry on ON_LINE state	ON-LINE (Substate conditional on REMOTE/LOCAL switch setting.)	None	"Control State LOCAL" or "Control State REMOTE" event occurs. Event reported based on actual ON-LINE substate activated.
8	LOCAL	Operator sets front panel switch to REMOTE.	REMOTE	None	"Control State REMOTE" event occurs.
9	REMOTE	Operator sets front panel switch to LOCAL.	LOCAL	None	"Control State LOCAL" event occurs.
10	ON-LINE	Equipment accepts "Set OFF-LINE" message from host (S1, F15).	HOST OFF-LINE	None	"Equipment OFF-LINE" event occurs.
11	HOST OFF-LINE	Equipment accepts host request to go ON-LINE (S1, F17).	ON-LINE	None	Host is notified to transition to ON-LINE at transition 7.
12	HOST OFF-LINE	Operator actuates OFF-LINE switch.	EQUIPMENT OFF-LINE	None	"Equipment OFF-LINE" event occurs.

3.2.5   Related Variables, Constants and Events

For complete descriptions, refer to the Appendix.

Name	Type
ControlState	Status Variable
CtrlRemoteSwitch	Status Variable
CtrlOnlineSwitch	Status Variable
DefCtrlOfflineState	Equipment Constant
DefaultCtrlState	Equipment Constant
PreviousControlState	Status Variable
ControlStateLocal	Collection Event
ControlStateRemote	Collection Event
EquipmentOffline	Collection Event

3.3   Equipment Processing

3.3.1   General Description

The Equipment Processing State Model defines the operation of the machine. Because operation varies between machines, the GEM standard does not define a specific model.

3.3.2   Equipment Processing State Diagram
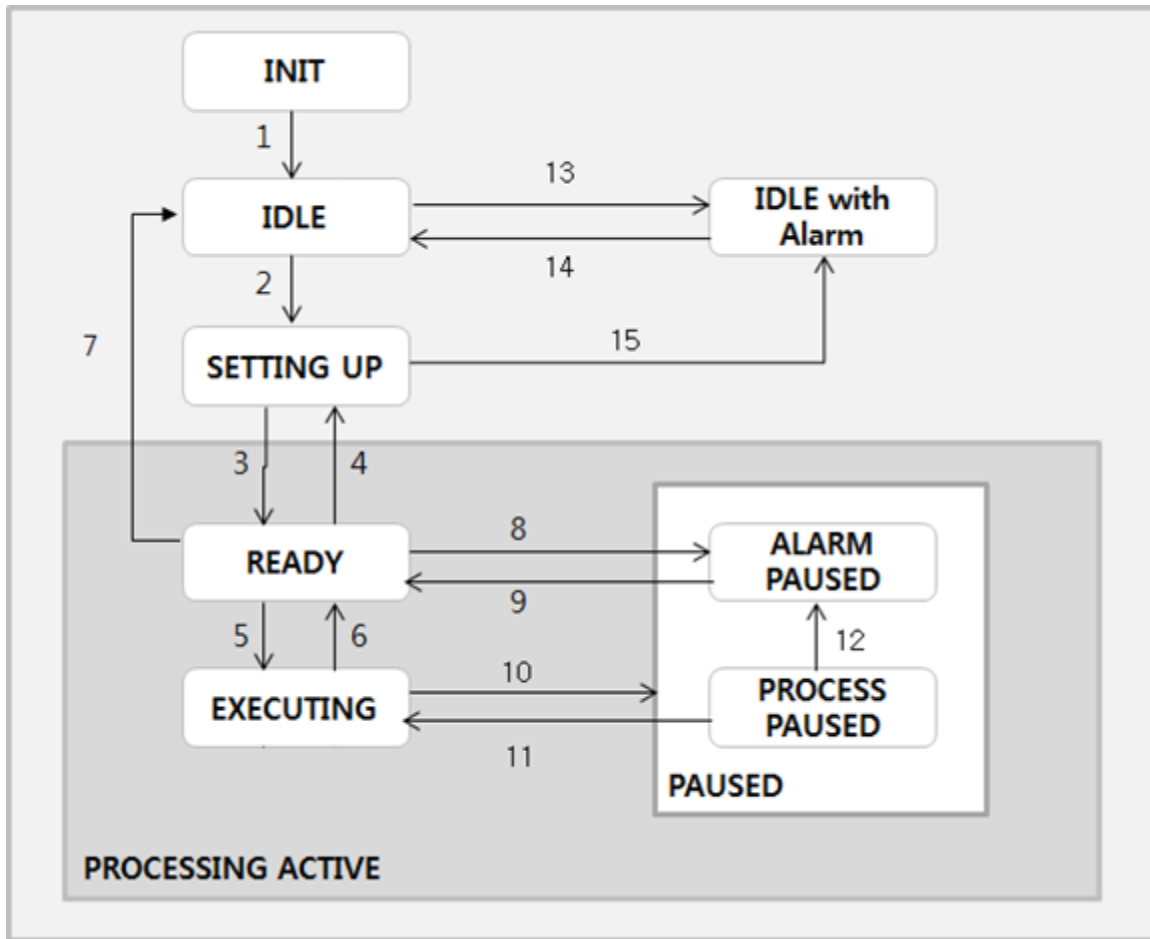
3.3.3   Equipment Processing State Definitions

3.3.3.1   INIT

Equipment initialization is occurring. Equipment remains in this state unless initialization is successful. A TCP/IP connection has not been made for the machine with the WinMCS.exe or Equipment is in POWER-OFF state, or disconnected with KSMARTVisApp™.

3.3.3.2   IDLE

Awaiting a command.

3.3.3.3   IDLE with Alarm

An alarm has occurred in the IDLE state, and the equipment is waiting for all alarms to be cleared.

3.3.3.4   PROCESSING ACTIVE

This state is the parent of all substates where the context of a process program execution exists.

3.3.3.5   PROCESS

This state is the parent of those substates which refer to the active preparation and execution of a process program.

3.3.3.6   SETTING UP

The equipment is being set up so that external conditions are satisfied to start processing the material. This includes the receipt of any process program and material to be processed and their validation.

3.3.3.7   READY

The equipment is ready to begin processing and is awaiting a START command from the operator or host.

3.3.3.8   EXECUTING

The equipment is processing material automatically and can continue to do so without external intervention.

3.3.3.9   PAUSE

Process has been suspended. This state has two substates. PROCESS PAUSED and ALARM PAUSED.

3.3.3.10   PROCESS PAUSED

The equipment is free of alarm conditions in the PAUSE state. The equipment is awaiting a command (RESUME)

3.3.3.11   ALARM PAUSED

An alarm has occurred in the PROCESS or PROCESS PAUSED states, and the equipment is waiting for the alarm to be cleared.

3.3.4   Equipment Processing State Transition Table

#	Previous State	Trigger	New State	Actions	Comments
1	INIT	• All equipment initialization is complete with no alarms or error conditions. MCS program is loading successfully and HOMMING is done.	IDLE	• Equipment awaits a PP-SELECT command	IDLE state entry program is selected.
2	IDLE	• A process program is selected manually or the equipment has received a PP-SELECT command with correct recipe name.	SETTING UP	• The equipment verifies all the parameters of process program, and if necessary, it adjusts the conveyor width according to the selection of the operator.	
3	SETTING UP	• All setup activity has completed, and the equipment is ready to receive a START command	READY	• The equipment is waiting for a START command.	The selected process program is available for execution.
4	READY	• The equipment has received a PP-SELECT command from the host or operator action.	SETTING UP	• The equipment loads job file and performs homing operation	
5	READY	• The equipment has received a START or RESUME command from the host or operator action.	EXECUTING	• The equipment is processing material automatically.	
6	EXECUTING	• There is no more material has to be inspected and there is no more Lot information to be processed in the Lot Queue. • The equipment has received a STOP command or Operator action and there is no Lot in the Lot queue. If the equipment's received a STOP remote command during processing, it waits until all the carriers are out.	READY	• The equipment is waiting for a START command.	
7	READY	• Unload Program	IDLE	•	
8	READY	• An alarm is set before processing started	ALARM PAUSED	• The equipment waits for all alarms to be clea	

9	ALARM PAUSED	● All alarms have been cleared	READY	● The equipment is waiting for a START command.	
10	EXECUTING	● An alarm occurs.	ALARM PAUSED	● Processing activity is suspended, and the equipment is waiting for all alarms to be cleared.	
		● The equipment has received a PAUSE command from the host or operator action	PROCESS PAUSED	● The equipment is waiting for a RESUME command.	
11	PROCESS PAUSED	● The equipment has received a RESUME command from the host or operator action.	EXECUTING	● The equipment will resume processing.	
12	PROCESS PAUSED	● An alarm is set.	ALARM PAUSED	● The equipment waits for all alarms to be cleared.	
13	IDLE	● An alarm is set.	IDLE with Alarm	● The equipment waits for all alarms to be cleared.	
14	IDLE with Alarm	● All alarms have been cleared.	IDLE	●	
15	SETTING UP	● Recipe loading failed or it is invalid recipe.	IDLE with Alarm	The equipment waits for all alarms to be cleared.	

3.3.5   Equipment Processing State Code Table

Name	Code
INIT	1
IDLE	2
READY	3
EXECUTING	4
SETUP	5
PROCESS_PAUSE	6
ALARM_PAUSE IDLE with Alarm	7

3.3.6   Related Variables, Constants and Events

For complete descriptions, refer to the Appendix.

Name	Type
ProcessStateString	Status Variable
PreviousProcessState	Status Variable
ProcessState	Status Variable
ProcessingCompleted	Collection Event
ProcessingStarted	Collection Event
ProcessingStateChange	Collection Event
ProcessingStopped	Collection Event

3.4   Limits Monitoring

3.4.1   General Description

The Limits Monitoring State Model allows the equipment to monitor certain status and data variable values. It allows the host to define limit boundaries. The equipment notifies the host using a collection event whenever configured variables transition across limit boundaries.

The limits monitoring capability provides the host a means of monitoring equipment conditions by a flexible, efficient and asynchronous method which is consistent across equipment. It eliminates the need for frequent status variable polling. This capability also allows the host to implement changes in the monitoring range as needed. This capability has application to both production operation and diagnostic/testing scenarios and it has applicability to statistical process control.

Limits monitoring may be configured for each available variable according to this diagram.
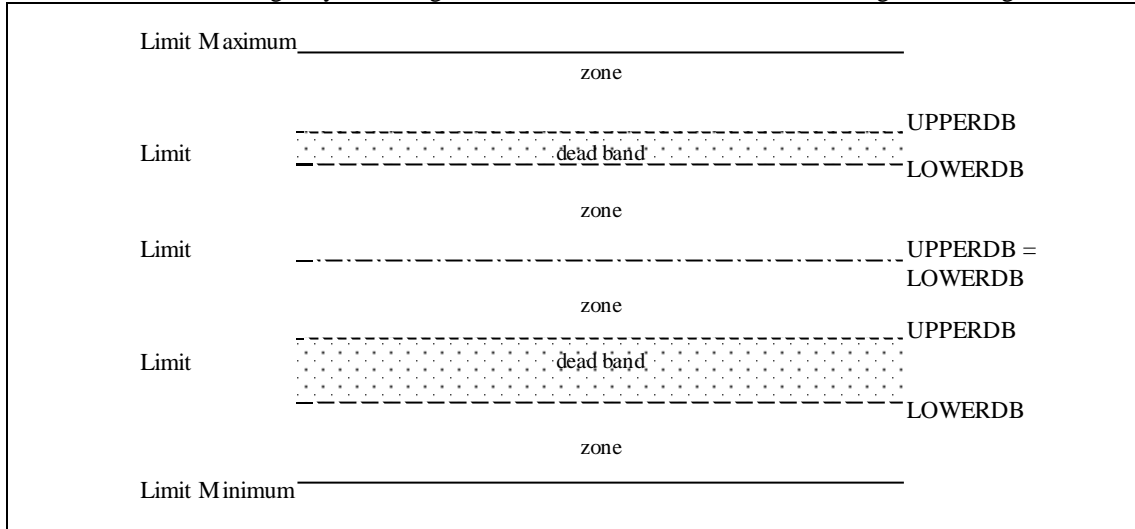
Notice that each limit has an upper dead-band and lower dead-band value. The region between the two is called the dead-band. If the upper and lower dead-band values are equal, then there is no dead-band. The regions above and below the limit are called zones. A zone transition occurs when the value crosses above the upper dead-band or below the lower dead-band. The host may define as many limits as desired.

UPPERDB and LOWERDB values are restricted by the following formula:

Limit Maximum ≥ UPPERDB ≥ LOWERDB ≥ Limit Minimum

A limit divides the possible range of variable values into two parts, the upper zone and the lower zone. At any time, the monitored variable is considered to be in one and only one of these zones. However, as Figure 4.2.2 in the SEMI E30 manual shows, these two zones have an area of overlap. This is called the dead-band.

The dead-band is a critical element of Limits Monitoring. Its purpose is to prevent a phenomenon known as chattering -- the repeated changing of zones due to small, rapid fluctuations in variable value while near the zone boundary. In practice, the value of a variable must reach the opposite boundary of the dead-band before a zone transition can occur. Thus, if a variable's value reaches the UPPERDB and transitions into the upper zone, it will not return to the lower zone until it falls back to the LOWERDB. The difference between UPPERDB and LOWERDB should always be greater than the typical amplitude of those fluctuations deemed insignificant. In some cases, the width of the dead-band may set to zero (i.e., UPPERDB = LOWERDB). At first glance, this would seem to make indeterminate the current zone when an integer value sits on the limit. This is not the case, however, when movement of the value is considered. To illustrate, an example is given, assuming that UPPERDB = LOWERDB = 100.

Transition from one zone into another generates a collection event, as might be reported via S6, F11. The host has the option of receiving notification by enabling event reporting for the event. For each variable that has monitoring capability, one CEID is reserved to indicate zone transitions for that variable.

The sampling frequency is an important aspect of Limits Monitoring. If the value changes frequently compared to sampling frequency, it is possible for some zone transitions to be missed or for multiple zone transitions to occur between readings. Since it is possible for zone transitions to occur "simultaneously" and for limit boundaries to be identical, the "event limit" data variable allows a list of multiple zone transitions of a variable to be reported with a single collection event.

3.4.2   Limits Monitoring State Diagram
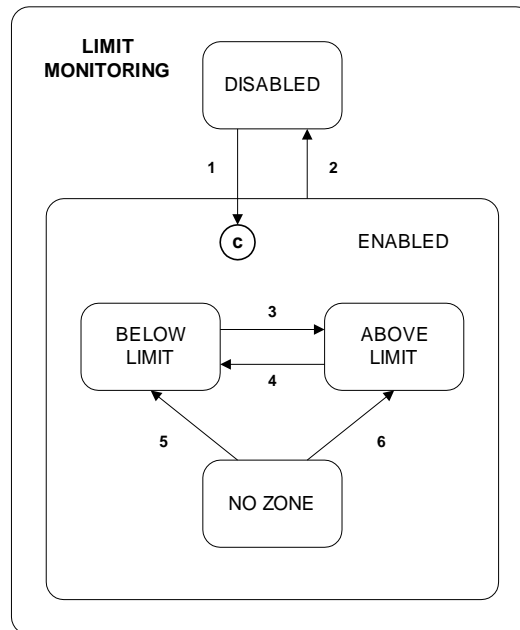
3.4.3   Limits Monitoring State Definitions Table

3.4.3.1   ABOVE LIMIT

A variable is considered to be above a limit when its value increases to equal or exceed the upper boundary of the dead-band, UPPERDB. The significance attached to this state is a function of the host's usage.

3.4.3.2   BELOW LIMIT

A variable is considered to be below a limit when its value decreases to equal or fall below the lower boundary of the dead-band, LOWERDB. The significance attached to this state is a function of the host's usage.

3.4.3.3   NO ZONE

In some circumstances, it is possible for the variable value to be in neither the upper zone nor the lower zone. This may occur upon definition of a new limit or upon equipment startup when the value of the variable lies in the dead-band. In this case, the active state of the limit is considered NO ZONE. The limit remains in this state until the variable value reaches either boundary of the dead-band.

3.4.4   Limit Monitoring State Transition Table

#	Current State	Trigger	New State	Action	Comment
1	DISABLED	Limit attributed defined with S2, F45.	ENABLED	None	The substate of ENABLED is determined by the current value of the monitored variable.
2	ENABLED	Limit attributes set to undefined with S2, F45.	DISABLED	None	None
3	BELOW LIMIT	Variable increased to be ≥ UPPERDB.	ABOVE LIMIT	None	Zone Transition
4	ABOVE LIMIT	Variable decreases to be ≤ LOWERDB.	BELOW LIMIT	None	Zone Transition
5	NO ZONE	Variable decreases to be ≤ LOWERDB.	BELOW LIMIT	None	Zone Transition
6	NO ZONE	Variable increases to be ≥ UPPERDB.	ABOVE LIMIT	None	Zone Transition

3.4.5   Related Variables, Constants and Events

For complete descriptions, refer to the Appendix.

Name	Type

EventLimit	Data Variable
LimitVariable	Data Variable
TranistionType	Data Variable

The following variables are available for limits monitoring.

Name	Type	Limit Collection Event

3.5   Alarms

3.5.1   General Description

The alarm management capability provides for host notification and management of alarm conditions occurring on the equipment. This alarm management provides several useful tools.

- Reporting the time of an alarm state change.
- Uploading a list of alarm texts.
- Enabling and disabling the notification of specific alarms.
- Host query of alarms set and enabled status on the equipment.

An alarm is related to any abnormal situation on the equipment that may endanger people, equipment, or material being processed. Such abnormal situations are defined by the equipment manufacturer based on physical safety limitations. Equipment activities potentially impacted by the presence of an alarm are inhibited. Note that exceeding control limits associated with process tolerance do not constitute an alarm nor do normal equipment events such as the start or completion of processing.

3.5.2   Alarms State Diagram
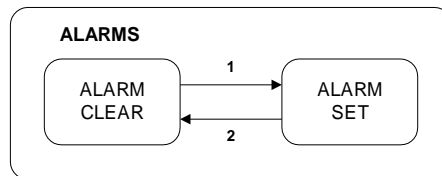
3.5.3   Alarms State Definitions

3.5.3.1   ALARM CLEAR

The alarm is inactive. The situation is normal or safe.

3.5.3.2   ALARM SET

The alarm is active. The situation is abnormal or unsafe.

3.5.4   Alarms State Transition Table

#	Current	Trigger	New State	Action	Comment
1	$ALARM_n$ CLEAR	$ALARM_n$ is detected on the equipment.	$ALARM_n$ SET	Initiate local actions (if any) to ensure safety. Update "AlarmsSet and $ALCD_n$ values." Generate and issue alarm message if enabled.	Inhibited activities require operator or host intervention prior to resuming.
2	$ALARM_n$ SET	$ALARM_n$ is no longer detected on the equipment.	$ALARM_n$ CLEAR	Update AlarmsSet and $ALCD_n$ values. Generate and issue alarm message if enabled.	Inhibited activities require operator or host intervention prior to resuming.

3.5.5   Related Variables, Constants and Events

For complete descriptions, refer to the Appendix.

Name	Type
ASer	Status Variable
AlarmState	Status Variable
AlarmsEnabled	Status Variable

AlarmsSet	Status Variable
AlarmID	Data Variable
AlarmCode	Data Variable
AlarmText	Data Variable
WBitS5	Equipment Constant

3.6   Spooling

3.6.1   General Description

Spooling allows the equipment to queue messages intended for the host during times of unexpected communication failure and subsequently deliver these messages when communication is restored. Spooling is limited to primary messages of host-selected streams and functions.

The purpose of spooling is to provide a method for retaining equipment message data that might otherwise be lost due to communication failure. The motive for producing this functionality is to retain valuable data used to track material and to improve product quality. The spooling capability fills a gap in the SEMI E5 standard. In the past, without a spooling capability, equipment has typically discarded messages that could not be delivered, or turned messaging off altogether. It is intended that the host initiate the spool unload process immediately following the reestablishment of communications.

3.6.2   Spooling State Diagram

3.6.3   Spooling State Definitions

3.6.3.1   POWER OFF

The equipment has lost power for any reason (e.g. power failure, power switch set to off, etc.).

3.6.3.2   POWER ON

The equipment is powered up.

3.6.3.3   SPOOL INACTIVE

This is the normal operating mode. No spooling occurs. The spool area is empty. Primary SECS-II messages are transmitted normally.

3.6.3.4   SPOOL ACTIVE

All primary SECS-II messages ready for sending and for which spooling is enabled (see S2, F43) are directed to the spool area. All other primary messages, except Stream 1, are discarded. The equipment attempts to send any generated secondary messages, yet discards them if the attempt to send fails.

Once communications are established, the host must initiate the spool unload sequence to restore full functionality (see below). Since the equipment will deliver secondary messages, the host may inquire for information or send commands as needed.

The SPOOL ACTIVE State has two substates, SPOOL LOAD and SPOOL UNLOAD. This means that they operate independently, though sharing data and some state change stimuli.

3.6.3.5   SPOOL LOAD

The SPOOL LOAD component enters messages into the spool area. It is divided into two substates: SPOOL NOT FULL and SPOOL FULL. SPOOL NOT FULL is the default entry substate of the parent state SPOOL LOAD.

3.6.3.6   SPOOL NOT FULL

As primary SECS-II messages are directed to the spool area, the equipment "writes" the SECS-II message to the end of the spool. Spooling status variables are incremented each time a message is placed in the spool area.

3.6.3.7   SPOOL FULL

In this state, all of the allocated spooling area is filled. The following options are equipment constant controlled. The first message to be dealt with is that which could not be fit into the spool prior to transition from SPOOL NOT FULL (see transition table below).

If the "OverWriteSpool" equipment constant is true and the spool is full, then the equipment will delete the "oldest" record (e.g. SECS-II message) contained in the spool area to make space before adding the new message. The "SpoolCountTotal" status variable is incremented whenever a message is submitted to the spool area. The "SpoolCountActual" status variable is manipulated to keep an accurate count of the number of messages contained in the spool area.

If the "OverWriteSpool" equipment constant is false, then the subsequent primary messages are discarded. When such a message is discarded, the "SpoolCountTotal" SV is still incremented, and the "SpoolCountActual" remains unchanged.

3.6.3.8   SPOOL UNLOAD

The SPOOL UNLOAD component of SPOOLACTIVE deals with movement of messages out of the spool. It has an active substate (SPOOL OUTPUT) and a passive substate (NO SPOOL OUTPUT). NO SPOOL OUTPUT is the default entry substate since the equipment is NOT COMMUNICATING at the time spooling is initiated. When communications between equipment and host are restored, there is an opportunity for the host to recover spooled messages. No action is taken until the host initiates the spool output process via the S6, F23 (Request Spooled Data). The host has the option to either receive the spooled messages (see substate TRANSMIT SPOOL) or discard all messages in the spool (see substate PURGE SPOOL).

3.6.3.9   NO SPOOL OUTPUT

In this state, no messages are removed from the spool.

3.6.3.10   SPOOL OUTPUT

The SPOOL OUTPUT State encompasses the removal of messages from the spool. Its substates are TRANSMIT SPOOL and PURGE SPOOL.

3.6.3.11   TRANSMIT SPOOL

The host elects to receive all messages contained in the spool area. The equipment is expected to keep track of the oldest record (i.e. message) within the spool area. When communications are re-established with the host and transmission of the spool area is started, the oldest record is the first record transmitted then the next oldest record, etc. There is no prioritization of messages to be sent from the spool.

As each spooled message is successfully transmitted to the host, it is removed from the spool area upon successful completion of the transaction. The "SpoolCountActual" SV is decremented as each message is removed from the spool. The equipment transmits messages only from the spool area until all spooled messages have been completely transmitted to the host.

Flow control of the spool transmit process is achieved in two ways. First, only one open transaction on the equipment is allowed during spool unload. Thus, if a message requires a reply, the equipment waits for that reply before transmitting the next spooled message. Messages that require no reply are transmitted sequentially as rapidly as the message transfer mechanism will allow.

The second flow control method is to allow the host to limit the maximum number of messages sent from the spool in response to the S6, F23 request. The "MaxSpoolTransmit" equipment constant may be set by the host to achieve this behavior. If set to five, for example, the equipment will send the first five messages from the spool and then transition to the NO SPOOL OUTPUT State, awaiting the nextS6, F23 request. There is no event report generated when the "maximum spool transmit" value is reached. The host is responsible for determining this situation by one of the following:

- counting the messages received
- timing out waiting for the next message
- inquiring to the equipment for the current value of the "SpoolCountActual" SV
- some combination of the above

If the "MaxSpoolTransmit" equipment constant is set to zero, the spool is transmitted completely in response to S6, F23.

Normal spooling continues during the spool transmit process. If the SPOOL LOAD component transitions to SPOOL FULL, it does not have any effect on the SPOOL UNLOAD component. Once full, the spool cannot make the transition back to SPOOL NOT FULL except via the SPOOL INACTIVE State. Space made available due to the spool unload process is not used in this case.

When a multi-block message is to be transmitted from the spool, any required inquire/grant transaction is initiated. If the host's response denies permission to send the multi-block message, the equipment discards that message and continues with the transmit process. This sequence counts as one message in the "maximum spool transmit" EC count.

SPOOL LOAD and SPOOL UNLOAD may interact when the spool is full and "OverwriteSpool" EC is True. During the spool transmission process, spooled messages are removed while new primary messages are written to the spool. These new messages are overwriting the oldest messages available, unless the process of unloading has made sufficient spool space available. There is a possibility that unloading and overwriting processes may compete for control of the same message area. The loss of continuity may be "disorienting" to the host program receiving the messages. It is expected that the unloading process will be fast relative to the generation of new messages, so this occurrence will be rare.

Should a communication failure occur during the spool transmit process, spooling continues as before the transmit process began. However, the spool unload sequence terminates (i.e. transition to NO SPOOL OUTPUT will occur--see transition table below).

3.6.3.12   PURGE SPOOL

The equipment discards all messages in the spool and, when the spool is empty, "SpoolCountActual" SV becomes zero.

3.6.4   Spooling State Transition Table

#	Current State	Trigger	New State	Action	Comment
1	SPOOL INACTIVE	Communication failure detected	SPOOL ACTIVE	Status variables "SpoolCountActual" and "SpoolCountTotal" are initialized to zero. Any open transactions with the host are aborted. Status variable "SpoolStartTime" is set to current time. Alert the operator that spooling is active.	The default state in each OR substate is entered. Unsent messages remain in the queue until handled within the SPOOL ACTIVE state. The "SpoolingActivated" collection event has occurred.
2	SPOOL NOT FULL	Message generated which will not fit into spool area.	SPOOL FULL	Status variable "SpoolFullTime" is set to current time. Alert the operator that the spool is full.	The message that would not fit into the spooling area is dealt with after the transition. No collection event is generated.
3	SPOOL OUTPUT	Spool area emptied.	SPOOL INACTIVE	Spooling process disabled. Alert the operator that spooling has been terminated.	The "SpoolingDeactivated" collection event has occurred. Transition from the AND substate SPOOL LOAD component occurs.
4	NO SPOOLOUTPUT	S6, F23 received w/RSDC=1	PURGE SPOOL	No action	Initiates purging process. No collection event is generated since this is based on host request.
5	NO SPOOLOUTPUT	S6, F23 received w/RSCD=0	TRANSMIT SPOOL	No action	Initiates message transmission from spool. No collection event is generated

					since this is based on host request.
6	TRANSMIT SPOOL	Communication failure or "MaxSpoolTransmit" EC value reached.	NO SPOOL OUTPUT	Spool transmission process suspended	If communications failure, the "SpoolTransmitFailure" collection event has occurred. No collection event is generated for "MaxSpoolTransmit" EC value reached.
7	POWER ON	Equipment power source discontinued.	POWER OFF	No action	Spooling context has been maintained in non-volatile storage prior to this transition.
8	POWER OFF	Equipment power source restored.	POWER ON	Spooling context restored from non-volatile memory.	If spooling were active prior to power down, it continues. If the TRANSMIT SPOOL was active at power down, then transition #6 is expected to follow since communications state is initially NOT COMMUNICATING.

3.6.5   Related Variables, Constants and Events

For complete descriptions, refer to the Appendix.

Name	Type
SpoolCountActual	Status Variable
SpoolCountTotal	Status Variable
SpoolFullTime	Status Variable
SpoolStartTime	Status Variable
SpoolState	Status Variable
MaxSpoolTransmit	Equipment Constant
OverwriteSpool	Equipment Constant
SpoolEnabled	Equipment Constant
SpoolTransmitFailure	Collection Event
SpoolingActivated	Collection Event
SpoolingDeactivated	Collection Event

4   MACHINE CAPABILITIES

4.1   *Establish Communications*

4.1.1   Purpose

Communications between host and equipment are formally established through use of the Establish Communications Request/Establish Communications Acknowledge transaction, S1, F13/F14.

4.1.2   Description

There are potential problems when one side of the communications link fails and the other side does not detect it. From the point of view of the host, a loss of communications has many possible causes. In some cases, host-controlled settings on the equipment may need to be reset. In other cases, the equipment may have continued an automatic processing sequence during the period of no communication and may have changed states.

The equipment considers communications as formally established whenever either of the following conditions has been satisfied. Satisfaction of either of these conditions will result in a transition to the COMMUNICATING sub-state. See the Communications State Model for further detail.

- Communications Request has been sent to the host and an Establish Communications Acknowledge has been received within the transaction timeout period and with an acknowledge code of "Accept", or

- Communications Request has been received from the host, and an Establish Communications Acknowledge response has been successfully sent with an acknowledge code of "Accept."

When the equipment is attempting to establish communications, an Establish Communications Request is sent periodically until communications have been formally established as described above. The interval between attempts is user-configurable and begins as soon as a connection transaction failure is detected (see Communications State Model).

Attempting to establish communications is not a low-level connectivity issue, but rather a logical application issue used by either party to notify its partner that the host may need to perform synchronization activities with the equipment.

4.1.3   Scenarios

4.1.3.1   Host Attempts to Establish Communications

COMMENT	HOST	EQUIPMENT	COMMENT
Establish Communications	S1, F13 ➔		
			Communications state is enabled (any substate)
		⬅ S1, F14	Reply COMMACK = Accept and Communications state = COMMUNICATING

4.1.3.2   Equipment Attempts To Establish Communications and Host Acknowledges

COMMENT	HOST	EQUIPMENT	COMMENT
			Communications State = NOT COMMUNICATING
		⬅ S1, F13	[LOOP] [LOOP] -- SEND Establish Communications Request

Establish Communications Acknowledge	S1, F14 ➔		[IF] S1, F14 received without timeouts
			[THEN] exit loop -- SEND
			[ELSE] Delay for interval in EstablishCommunicationsTimeout
			[ENDIF]
			[END_LOOP]--SEND
			[IF] COMMACK = Accept
			[THEN] Communications state =
			      Communicating
			        exit loop --

			[ELSE] Reset timer for delay, and delay for interval specified in EstablishCommunicationsTimeout [ENDIF] [END_LOOP]

4.1.3.3   Simultaneous Attempts to Establish Communications

For equipment that supports interleaving, it is possible that either the host or equipment could send an Establish Communications Request before receiving the request from its partner. As communications are established by the successful acceptance of any one Establish Communications Request, it is immaterial who sends the request first. The roles of host and equipment may be reversed.

4.1.3.3.1   Equipment Receives S1, F14 From Host Before Sending S1, F14

COMMENT	HOST	EQUIPMENT	COMMENT
			Communications State = NOT COMMUNICATING
		← S1, F13	Establish Communications Request
Establish Communications Request	S1, F13 →		
Reply COMMACK = Accept	S1, F14 →		S1, F14 received from Host and Communications established* and Communications state = COMMUNICATING
		← S1, F14	Reply COMMACK = Accept**

4.1.3.3.2   Equipment Sends S1, F14 To Host Before Receiving S1, F14

COMMENT	HOST	EQUIPMENT	COMMENT
			Communications State = NOT COMMUNICATING
		← S1, F13	Establish Communications Request
Establish Communications Request	S1, F13 →		
		← S1, F14	Reply COMMACK = Accept* Communications established** and Communications state = COMMUNICATING
Reply COMMACK = Accept	S1, F14 →		S1, F14 received from Host

Communications are established at the successful completion of the S1, F13/F14 transaction where COMMACK is set to zero.

**   Communications are established on the successful transmission of S1, F14, even if there is an open S1, F13.

4.2   Dynamic Event Report Configuration

4.2.1   Purpose

This capability provides the data reporting flexibility required in some manufacturing environments. It allows the host to increase or decrease the data flow according to need. For example, if the performance of the equipment degrades, the data flow from that equipment may be increased to help diagnose the problem.

4.2.2   Detailed Description

The equipment supports the following event report configuration functionality through the SECS-II interface:

- Host definition/deletion of custom reports,

- Host linking/unlinking of defined reports to specified collection events, and

- Host enabling/disabling the reporting of specified collection events.

Note: The equipment may also supply alternative means for defining reports and linking reports to events (e.g. via the operator console). Implementation of alternate means is not required.

The equipment can be instructed by the host to enable or disable reporting of collection events on an individual or collective basis. A status variable (SV) is available that consists of a list of enabled collection events.

Reports may be attached to an event report message (S6, F11). These reports are linked to the desired collection event. They typically contain variables relating to that event. The reported data in the event report messages might include status variables (SV), equipment constants (EC), or data variables (DV). Note that data variable values are only valid upon certain events and should be included only in reports linked to those events.

4.2.3   Scenarios

4.2.3.1   Collection Event Reporting Set-up

COMMENT	HOST	EQUIPMENT	COMMENT
[IF] Define Report is Multi-block [THEN] send Multi-block inquire	S2, F39 ➔		
[ENDIF]		← S2, F40	Multi-block grant
Send report definitions	S2, F33 ➔		DATAIDs, RPTIDs and VIDs received
		← S2, F34	DRACK* = 0 the reports are OK
[IF] Link Events/Report is Multi-block [THEN] send Multi-block inquire	S2, F39 ➔		
		← S2, F40	Multi-block grant
[ENDIF]			
Link reports to events	S2, F35 ➔		CEIDs and the corresponding RPTIDs are received
		← S2, F36	LRACK = 0 the event linkages are acceptable.
Enable specific collection events	S2, F37 ➔		Enable/disable codes (CEEDs) and the respective event reporting CEIDs received.
		← S2, F38	ERACK = 0 OK, will generate the specified reports when the appropriate collection events happen.

4.3   *Data Variable and Collection Event Namelist Requests*

4.3.1   Purpose

This capability allows the host to query for the data variables and collection events that are available from the equipment.

4.3.2   Detailed Description

The host may request a list of data variables from the equipment including their VID, name and units.   In addition, the host may request a list of collection events from the equipment including their CEID, name, and list of associated DVs.

4.3.3   Scenarios

4.3.3.1   Host Requests Data Variables

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests data variables	S1, F21 ➔		
		← S1, F22	Equipment responds with list of data variable information

4.3.3.2   Host Requests Collection Events

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests collection events	S1, F23➔		

COMMENT		EQUIPMENT	COMMENT
		← S1, F24	Equipment responds with list of collection event information

4.4   Variable Data Collection

4.4.1   Purpose

This capability allows the host to query for the equipment variables and is useful during initialization and synchronization.

4.4.2   Detailed Description

The host may request a report containing data variables from the equipment by specifying the RPTID. It is assumed that the report has been previously defined (e.g. using the Define Report S2, F33 transaction; refer to Event Data Collection). The values of any status variables (SV) and equipment constants (EC) contained within the report must be current. Discrete data values (DV) are only guaranteed to be valid upon the occurrence of a specific collection event.

4.4.3   Scenarios

4.4.3.1   Host Requests Report

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests data variables contained in report RPTID	S6, F19 →		
		← S6, F20	Equipment responds with list of variable data for the given RPTID.

4.5   Trace Data Collection

4.5.1   Purpose

Trace data collection provides a method of sampling data on a periodic basis. The time-based approach to data collection is useful in tracking trends or repeated applications within a time window, or monitoring of continuous data.

4.5.2   Detailed Description

The equipment establishes a trace report as instructed by the host (S2, F23). For a trace report (S6, F1) the host designates the following:

- Trace report identifier (TRID)
- Time interval for data sampling (DSPER)
- Total number of samples to be taken (TOTSMP)
- Number of samples per trace report (REPGSZ)
- Listing of which data will be sent with the report

The number of trace reports sent to the host is determined by total samples, divided by reporting group size (TOTSMP/REPGSZ).

The equipment samples the specified data at the interval designated by the host (DSPER) and sends a predefined trace report to the host for the specified reporting group size (REPGSZ). The trace report definition is automatically deleted from the equipment after the last trace report has been sent.

The host may modify or re-initiate a trace function currently in progress by specifying the same TRID in a trace request definition. At this point, the old trace is terminated and the new trace is initiated. The host may also instruct the equipment to terminate a trace report prior to its completion by specifying TOTSMP = 0 for that TRID, at which point the trace definition is deleted.

4.5.3   Scenarios

4.5.3.1   Host Initiates Trace Report

COMMENT	HOST	EQUIPMENT	COMMENT
Trace Data initialization requested	S2, F23 →		
		← S2, F24	Acknowledge, trace initiated

			[DO] TOTSMP REPGSZ times
			[DO] REPGSZ many times: collect SVID$_1$…SVID$_n$ data, delay time by DSPER.
			[END DO]
		← S6, F1	Send SV$_1$,…SV$_n$
Acknowledge receipt	S6, F2 →		[END DO]
Optional: Request trace termination prior to completion (TOTSMP = 0)	S2, F23 →		
		← S2, F24	Acknowledge premature termination

4.6   Status Data Collection

4.6.1   Purpose

This capability allows the host to query the equipment for selected status information and is useful in synchronizing with equipment status.

4.6.2   Detailed Description

The host may query equipment status by specifying the desired SVID. Upon such a request, the equipment sends the host the value of the selected status variables. The host also may request the description (name and units) of any or all status variables.

4.6.3   Scenarios

4.6.3.1   Request Equipment Status Report

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests report of selected status variable values.	S1, F3 →		
		← S1, F4	Equipment responds with the requested status variable data.

4.6.3.2   Request Equipment Status Variable Namelist

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests equipment to identify selected status variables.	S1, F11 →		
		← S1, F12	Equipment responds with the requested status variable descriptions.

4.7   Alarm Management

4.7.1   Purpose

Historically, a precise definition of an equipment alarm has been absent. Consequently, differing interpretations have resulted in inconsistent implementations. This is addressed by providing a more rigorous alarm definition.

In addition, it is often important for equipment to report more extensive information to the host than has been available in the S5, F1/F2 (Alarm Report Send/Acknowledge) transaction. The data required in such cases is very dependent on equipment type, host information requirements, and alarm situation. This issue is addressed by providing event-reporting methods that are tied to alarm state changes.

Lastly, the alarm management capability provides mechanisms for the following.

- Reporting the time of an alarm state change
- Uploading a list of alarm texts
- Enabling and disabling the notification of specific alarms
- Host query of alarms set and enabled status on the equipment

4.7.2   Detailed Description

Two alarm notification mechanisms are defined to achieve the flexibility necessary for the reporting required by host systems. First, stream 5 alarm reporting enables a brief, yet fixed, method for notification of alarm occurrences using

the S5, F1/F2 transaction. Second, two collection events (a "Set" and "Clear" event) are defined for each alarm defined on the equipment to allow the use of event data collection mechanisms. This addresses the hosts' potential need for more extensive and flexible data reporting. In the latter case, reports are sent by the equipment using the Event Report/Acknowledge transaction (refer to Event Data Collection).

In the Alarm State model, the transition from the ALARM CLEAR to the ALARM SET state (transition 1) will trigger the set event for the alarm. Conversely, the transition from ALARM SET to ALARM CLEAR state (transition 2) will trigger the clear event.

NOTE: The alarm capability is intended as an addition to standard safety alarms (e.g. lights, horns, etc.). There is no intent to replace direct operator notification of such problems, nor is there the expectation that the host can prevent or directly address such alarms.

4.7.2.1   Differences Between Events and Alarms

EVENT	ALARM
An event is any occurrence detectable by the equipment.	An alarm is related to only those occurrences that are abnormal, undesirable, AND endanger people, equipment, or physical material being processed.
Certain events may trigger a state transition(s).	Each alarm has an associated two-state state model: ALARM SET (or unsafe) and ALARM CLEAR (or safe).
Equipment activities are not necessarily inhibited by the occurrence of an event (unless it is associated with an alarm or intentional inhibit).	The presence of an alarm inhibits equipment activities to ensure safe operation until the alarm condition is cleared.
Certain events may occur in an expected sequence.	Alarms may occur at any time.

4.7.3   Scenarios

Note: Consult event-reporting sections of this document for descriptions of enabling, disabling, and sending collection event reports.

4.7.3.1   Enable/Disable Alarms

COMMENT	HOST	EQUIPMENT	COMMENT
Enable/Disable Alarm	S5, F3 ➜		
		← S5, F4	Acknowledge

4.7.3.2   Upload Alarm Information

COMMENT	HOST	EQUIPMENT	COMMENT
Request alarm data/text	S5, F5 ➜		
		← S5, F6	Send alarm data/text

4.7.3.3   List Enabled Alarms Request

COMMENT	HOST	EQUIPMENT	COMMENT
Request enabled alarms	S5, F7 ➜		
		← S5, F8	Send alarm data/text

4.7.3.4   Send Alarm Report

Alarm occurrence detected by the equipment

COMMENT	HOST	EQUIPMENT	COMMENT
		← S5, F1	Send alarm report (if enabled)
Acknowledge	S5, F2 ➜		
		← S6, F11	Send event report (if enabled)
Acknowledge	S6, F12 ➜		

4.8   Remote Control

4.8.1   Purpose

This capability provides the host with a level of control over equipment operations.

4.8.2   Description

The equipment responds to host commands that provide the following functions relative to individual equipment implementations:

- Start processing

- Select a process program

- Stop processing

- Temporarily suspend processing

- Resume processing

- Abort processing

Remote commands are interpreted as "request action be initiated" rather than "do action." The equipment may then respond via S2, F42 with HCACK = 4 if the command "is going to be performed." This alleviates any transaction timeouts for commands that may take a long time to perform. The completion of the action initiated by the remote command (i.e., HCACK = 0 or 4) must result in either a state transition or other action that generates a collection event upon normal/abnormal completion.

The format for all remote commands is ASCII, with a maximum length of 20 characters. The character set is restricted to the printable characters (hexadecimal 21 through 7E). Note that spaces are not allowed.

A detailed list of supported remote commands is provided in the "Remote Commands" section.

4.8.3   Scenarios

4.8.3.1   Host sends a remote command message

COMMENT	HOST	EQUIPMENT	COMMENT
Host Command Send	S2, F41 ➔		Remote Command Message
		⬅ S2, F42	Host Command Acknowledge
		⬅ S6, F11	[IF] Command Accepted (HCACK = 0 or 4) [THEN] State change or other collection event occurrence
Event Report Acknowledge	S6, F12 ➔		

4.8.3.2   Host sends an enhanced remote command message

COMMENT	HOST	EQUIPMENT	COMMENT
Host Command Send	S2, F49 ➔		Enhanced Remote Command Message
		⬅ S2, F50	Host Command Acknowledge
		⬅ S6, F11	[IF] Command Accepted (HCACK = 0 or 4) [THEN] State change or other collection event occurrence
Event Report Acknowledge	S6, F12 ➔		

4.9   Equipment Constants

4.9.1   Purpose

This capability provides a method for the host to read and to change the value of selected equipment constants on the equipment.

4.9.2   Description

This capability allows the host to reconfigure equipment constants to support a variety of situations. Note that when the host changes an equipment constants value, the new value is not required to take effect immediately, although the equipment accepts the new value.

4.9.3   Scenarios

4.9.3.1   Host Sends Equipment Constants

Allow the host to change the value of one or more equipment constants.

COMMENT	HOST	EQUIPMENT	COMMENT

Host sends equipment constants	S2, F15 ➜		
		← S2, F16	EAC = 0 equipment sets constants

4.9.3.2   Host Equipment Constants Request

Allow the host to determine the current value of equipment constants.

COMMENT	HOST	EQUIPMENT	COMMENT
Host constant request	S2, F13 ➜		
		← S2, F14	Equipment constant data (NOTE: This capability also can be accomplished using S2, F19 and S6, F20.

4.9.3.3   Host Equipment Constant Namelist Request

Allow the host to retrieve basic information about the equipment constants available at the equipment.

COMMENT	HOST	EQUIPMENT	COMMENT
Host constant namelist Request	S2, F29 ➜		
		← S2, F30	Equipment constant namelist

4.9.3.4   Operator Changes Equipment Constant

COMMENT	HOST	EQUIPMENT	COMMENT
			Operator changes equipment constant at equipment operator console.
		← S6, F11	Equipment reports equipment constant change.
Host acknowledges event	S6, F12 ➜		

4.10 Process Program Management

4.10.1   Purpose

Process program management provides a means to transfer process programs and to share the management of those process programs between the host and equipment.

4.10.2   Description

A process program is the pre-planned and reusable set of instructions, settings, and parameters that determine the processing environment seen by the manufactured object. Process programs are also called recipes. It might be changed between runs and processing cycles.

Process programs allow the equipment's process, and/or the parameters used by that process, to be set and modified by the engineer to achieve different results. Different process programs may be required for different products, while often the same process program will be used for all lots of a given product. The engineer must be able to create such programs, to modify current programs, and to delete programs from equipment storage.

For the host to ensure that the proper process programs are on the equipment, there must be a means of transferring them from equipment to host and from host to equipment. The host also may need to delete process programs from the equipment's storage to make room for a process program to be downloaded. In addition, the host must be kept informed whenever a local change occurs in the contents or status of a process program.

Unformatted process programs may be uploaded and downloaded. This capability provides for both host- and equipment-initiated transfers. The equipment-initiated transfer may be used at the request of the process engineer or operator of the equipment. This machine only supports unformatted process programs.

If a process program exists with the same PPID as the one given in the SECS-II message, the old process program will be replaced. The PPID in the SECS-II message is used to identify the process program in non-volatile storage.

The equipment may deny overwriting or deleting a recipe if it is in use or affects the recipe in use.

4.10.3   Scenarios

4.10.3.1   Program Created, Edited or Deleted by Operator

COMMENT	HOST	EQUIPMENT	COMMENT
			New process program created, edited or deleted by operator of equipment. PPChangeName = PPID

COMMENT	HOST	EQUIPMENT	COMMENT
			PPChangeStatus = 1 (Created) = 2 (Edited) = 3 (Deleted)
			[IF] CEID for Process Program Change Event enabled [THEN]
		← S6, F11	Send Event Report
Event Report Acknowledge	S6, F12 →		

4.10.3.2   Process Program Deletion by Host

COMMENT	HOST	EQUIPMENT	COMMENT
Delete Process Program Send	S7, F17 →		
		← S7, F18	The process program is removed from non-volatile storage. Delete Process Program Acknowledge.

4.10.3.3   Process Program Directory Request

COMMENT	HOST	EQUIPMENT	COMMENT
Current EPPD Request	S7, F19 →		
		← S7, F20	Current EPPD Data

4.10.3.4   Host-Initiated Process Program Upload -- Unformatted

COMMENT	HOST	EQUIPMENT	COMMENT
Process Program Request	S7, F5 →		
		← S7, F6*	Process Program Data *If the process program does not exist, a zero-length list will be sent.

4.10.3.5   Equipment-Initiated Process Program Upload -- Unformatted.

COMMENT	HOST	EQUIPMENT	COMMENT
			[IF] Process program is multi-block [THEN]
		← S7, F1	Process Program Load Inquire
Process Program Load Grant	S7, F2 →		
			[END_IF]
		← S7, F3	Process Program Send
Process Program Acknowledge	S7, F4 →		

4.10.3.6   Host-Initiated Process Program Download -- Unformatted

COMMENT	HOST	EQUIPMENT	COMMENT
[IF] Process program is multi-block [THEN]			
Process Program Load Inquire	S7, F1* →		
		← S7, F2	Process Program Load Grant * S7, F1 should be used only to request permission to transfer a multi-block formatted or unformatted process program. It should not be used to select a process program for execution; the remote command PP-SELECT should be used.
[END_IF]			
Process Program Send	S7, F3 →		
		← S7, F4	Process Program Acknowledge

4.10.3.7   Equipment-Initiated Process Program Download -- Unformatted

COMMENT	HOST	EQUIPMENT	COMMENT

		← S7, F5	Process Program Request
Process Program Send	S7, F6 →		

4.11 Material Movement

4.11.1 Purpose

This capability is limited in implementation, serving to notify the host of the appearance or removal of material at the equipment's ports.

4.11.2 Description

This capability consists of alerting the host whenever material is sent or received from any of the ports on the equipment. Event specific information such as port identification and material identification also may be useful, but definition of these and other related DV are left to the implementation.

4.11.3 Scenarios

COMMENT	HOST	EQUIPMENT	COMMENT
			Material is sent or received at an equipment port.
		← S6, F11	Send Collection event to host
Host acknowledges	S6, F12 →		

4.12 Equipment Terminal Services

4.12.1 Purpose

Equipment Terminal Services allows the factory operators to exchange information with the host from their equipment workstations.

4.12.2 Detailed Description

The equipment is capable of displaying information passed to it by the host for the operator's attention. The information, or an indication of a message, remains on the equipment's display until the operator indicates message recognition. Message recognition results in a collection event that informs the host that the operator has actually viewed the information.

The equipment is capable of passing information to the host that has been entered from the operator's equipment console. This information is intended for host applications and is not processed by the equipment.

The equipment has no responsibility for interpreting any of the data passed to or from the host using this method.

4.12.3 Scenarios

4.12.3.1   Host sends information to an equipment's display device

COMMENT	HOST	EQUIPMENT	COMMENT
Host sends textual information to equipment for display to the operator on terminal x.	S10, F3 →		
		← S10, F4	Equipment acknowledges request to display text (equipment sets unrecognized message indicator).
			Operator indicates message recognition (equipment clears unrecognized message indicator).
		← S6, F11	Message recognition event. (see Event Data Collection for details).
Host acknowledges Optional:	S6, F12 →		
		← S10, F1	Operator responds with text via terminal x.
Host acknowledges receipt of operator text.	S10, F2 →		

4.12.3.2   Host sends information to an equipment's display device and then overwrites the information
             before operator recognizes message

COMMENT	HOST	EQUIPMENT	COMMENT
Host sends textual information to equipment for display to the operator on terminal x.	S10, F3 ➔		
		⬅ S10, F4	Equipment acknowledges request to display text (equipment sets unrecognized message indicator).
Host sends textual information to equipment for display to the operator on terminal x. This message overwrites the first one sent by the host since it is still unrecognized.	S10, F3 ➔		
		⬅ S10, F4	Equipment acknowledges request to display text (equipment sets unrecognized message indicator).
			Operator indicates message recognition. (Equipment clears unrecognized message indicator).
		⬅ S6, F11	Message recognition event
Host acknowledges	S6, F12 ➔		

4.12.3.3   Operator sends information to the host

COMMENT	HOST	EQUIPMENT	COMMENT
		⬅ S10, F1	Operator sends textual information via equipment terminal x.
Host acknowledges receipt of operator initiated message.	S10, F2 ➔		
(Optional) Host responds with information for display to the operator on terminal x.	S10, F3 ➔		
		⬅ S10, F4	Equipment acknowledges receipt of request to display text. Equipment sets unrecognized message indicator.
		⬅ S6, F11	Operator indicates message recognition; Message recognition event.
Host acknowledges	S6, F12 ➔		

4.12.3.4   Host sends a multi-block display message

COMMENT	HOST	EQUIPMENT	COMMENT
Send information	S10, F5 ➔		
		⬅ S10, F6	Accepted or denied Note that since multi-block display is supported, the equipment will not send the S10, F7 message.

4.13 Clock

4.13.1   Purpose

The clock capability enables time stamping of collection event and alarm reports. Time stamping is useful for resolving relative order of event/alarm occurrences and scheduling of equipment activities by the host.

The ability for the host to instruct the equipment to set an internal clock to a specified time value, and for the equipment to request the current date and time, is needed for effective time management and synchronization.

4.13.2   Detailed Description

The clock capability assumes the existence of a relative time reference on the equipment. This time reference is used as a basis for updating the time value of an equipment status variable called "Clock." The time reference must reflect the current time to within a resolution range of seconds to centiseconds (refer to the format for Clock in the SEMI E5

Standard). The purpose of time stamping with centiseconds is to resolve the order in which nearly simultaneous events occur rather than to provide a more precise record of the time of day at which they occurred. Where more than one event occurs within a given period of clock resolution, the centiseconds reported in the event time stamps must reflect the actual order that the events were detected. Equipment with a clock resolution of less than a second should report centiseconds. Otherwise, centiseconds should be assigned to reflect the relative order in which events were detected. Equipment unable to resolve time to less than a second and unable to reflect the relative order in which events were detected may report centiseconds as "00."

The host employs the "Date and Time Set Request" message (S2, F31) to initialize the value of Clock to the value contained in the TIME data item. Similarly, the equipment may employ the "Date and Time Request" message (S2, F17) to obtain a new initialization time for Clock. As before, the value of TIME returned by the host is used to set Clock. Note that since the precision of TIME is seconds and that for Clock is centiseconds, in both cases the initial value of Clock contains "00" for its centisecond digits upon initialization.

4.13.3   Scenarios

4.13.3.1   Equipment Requests TIME (Optional Scenario)

COMMENT	HOST	EQUIPMENT	COMMENT
		← S2, F17	Equipment requests a time value from the host.
Host responds with a TIME value	S2, F18 →		Equipment sets its internal time reference to the value of TIME received from the host.

4.13.3.2   Host Instructs Equipment to Set Time

COMMENT	HOST	EQUIPMENT	COMMENT
Host instructs equipment to set its time.	S2, F31 →		
		← S2, F32	The equipment sets its internal time reference to the value of TIME received from the host and acknowledges completion.

4.13.3.3   Host Requests Equipment's Current Time Value

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests equipment time.	S2, F17 →		
		← S2, F18	Equipment returns its internal time reference value to the host.

4.14 Limits Monitoring

4.14.1   Purpose

The limits monitoring capability provides the host a means of monitoring equipment conditions by a flexible, efficient and asynchronous method which is consistent across equipment. The host might avoid polling status values. Further, this capability allows the host to implement changes in the monitoring range as needed. This capability has application to both production operation and diagnostic/testing scenarios. It also might be applied to statistical process control.

4.14.2   Description

Limits monitoring is described previously in section 3.4.

4.14.3   Scenarios

4.14.3.1   Zone Transition Event occurs in equipment

COMMENT	HOST	EQUIPMENT	COMMENT
		← S6, F11	Send enabled event report to host
	S6, F12 →		

4.14.3.2   Host defines Limit Attributes

COMMENT	HOST	EQUIPMENT	COMMENT
[IF] S2, F45 is Multi-block [THEN] Send Multi-block inquire	S2, F39 →		

		← S2, F40	Multi-block grant
[END IF]			
Host defines new variable limit attributes	S2, F45 →		
		← S2, F46	Equipment acknowledges host request

4.14.3.3   Host queries equipment for current limits

COMMENT	HOST	EQUIPMENT	COMMENT
Host queries equipment for current variable limit attributes definitions	S2, F47 →		
		← S2, F48	Equipment returns report containing requested variable limit attribute values.

4.15 Spooling

4.15.1   Purpose

Spooling provides a method for retaining equipment message data that might otherwise be lost due to communication failure. The motive for producing this functionality is to retain valuable data used to track material and to improve product quality. The spooling capability fills a gap in the SEMI E5 standard. In the past, without a spooling capability, the equipment has typically discarded messages that could not be delivered, or turned messaging off altogether. It is intended that the host initiate the spool unload process immediately following the reestablishment of communications.

4.15.2   Description - Enabling Spooling

The equipment provides the host with the ability to enable and disable Spooling for any message (except Stream 1 messages, i.e. S1, F1 and S1, F13) via the S2, F43/F44 transaction. Spooling may be enabled for an entire Stream, for individual messages within a stream, or for any combination of the two. Streams and Functions not referenced in this message are not spooled. Spooling can be totally disabled by sending an S2, F43 with a zero length list for the first item (see S2, F43 definition).
The Spooling State Machine is described in section 3.6.

4.15.3   Scenarios

4.15.3.1   Define the Set of Messages to be Spooled

This Scenario is used to set up the list of messages that the equipment should spool (or by defining none, to disable spooling).

COMMENT	HOST	EQUIPMENT	COMMENT
Host defines messages to be spooled in case of communications failure.	S2, F43 →		
		← S2, F44	Equipment acknowledges setup

4.15.3.2   Define the Maximum Number of Messages to Send in Response to S6, F23

This Scenario sets the value of the "MaxSpoolTransmit" equipment constant.

COMMENT	HOST	EQUIPMENT	COMMENT
Host sends value for the "MaxSpoolTransmit" equipment constant. S2, F15 →			
		← S2, F16	Equipment acknowledges equipment constant change.

4.15.3.3   Request or Delete Spooled Data ("MaxSpoolTransmit" EC = 0)

This Scenario is used to initiate the transfer of the spooled data from the equipment to the host or to purge the spools.

COMMENT	HOST	EQUIPMENT	COMMENT
			Communications were lost and then re-established.
Host requests data that includes spool related status variables.	S1, F3 →		

NOTE: S1, F3 is one of various methods that could be used.			
		← S1, F4	Send status data
Request or delete spooled data	S6, F23 →		
		← S6, F24	Request spooled data acknowledgement.
			[IF] RSDC = 0 (Spool data requested). [THEN] The appropriate Streams and Functions are used to transmit the spooled data to the host. [ELSE_IF] RSDC = 1 [THEN] Spool data discarded. [END_IF]
		← S6, F11	SpoolingDeactivated event report sent
Acknowledge	S6, F12 →		

4.15.3.4   Request or Delete Spooled Data ("MaxSpoolTransmit" EC > 0)

This Scenario shows the effect of "MaxSpoolTransmit" EC < "SpoolCountActual" SV on the Spool Transmit process. For the purpose of illustration, the value of "MaxSpoolTransmit" EC is 5 and the "SpoolCountActual" SV is 8 (at the time communications are re-established). No messages are added to the Spool during the transmit process.

COMMENT	HOST	EQUIPMENT	COMMENT
			Communications were lost and then re-established.
Host requests data that includes spool related status variables.	S1, F3 →		
		← S1, F4	Send status data (e.g. "SpoolCountActual" SV = 8, "MaxSpoolTransmit" EC = 5).
Host requests spooled data (RSDC =0).	S6, F23 →		Request spooled data acknowledgement. The five oldest messages in the Spool are transmitted to the host. Spooling remains active.
		← S6, F24	Request spooled data acknowledgement.
Host recognizes that "MaxSpoolTransmit" EC is reached.			
Host requests additional spooled data (RSDC =0).	S6, F23 →		
		← S6, F24	The remaining messages are transmitted from the spool.
		← S6, F11	"SpoolingDeactivated" collection event report sent.
Acknowledge	S6, F12 →		

4.16 Control (Host-Initiated)

4.16.1   Purpose

This section complements the Control State Model description found in section 3.2. It defines the requirements for implementation of this model.

4.16.2   Description Control Configuration

The control state model has two areas of configuration. The first area is related to the default entry states of the state model. Upon system initialization, the system must activate either the ON-LINE or the OFF-LINE state. Upon entry to OFF-LINE, the system must in turn activate one of the substates of OFF-LINE (EQUIPMENT OFF-LINE, ATTEMPT ON-LINE, or HOST OFF-LINE). In both these cases, the user configures the equipment to make the choices appropriate to that factory. Entry to the ON-LINE state also involves a choice of substates. In this case, the equipment reads the front panel REMOTE/LOCAL switch to determine the appropriate state.

The second area of configuration involves the transition to be made if the ON-LINE attempt should fail. The model may be set to transition to either HOST OFF-LINE or to EQUIPMENT OFF-LINE should the S1, F1 transaction be

terminated unsuccessfully. Choosing HOST OFF-LINE allows the host to cause the equipment to transition to ON-LINE when the host becomes ready. This is accomplished via the message S1, F17 (see below).

4.16.2.1   Changing Control State

In the control state model, both the operator and the host can affect the control state. The operator retains ultimate authority to set the equipment OFF-LINE by means of an OFF-LINE switch mechanism. The operator also can cause the equipment to attempt to go ON-LINE. Under some circumstances, the host can initiate the transition to ON-LINE.

If the operator requests to go ON-LINE, the equipment will send an S1, F1 to the host. The host may confirm ON-LINE with an S1, F2 or deny ON-LINE by sending an S1, F0. If there is no host response (i.e., reply timeout), the equipment treats it as a denial.

When the equipment is ON-LINE, the host may request that it transition to OFF-LINE. It transitions to the HOST OFF-LINE substate. When the equipment HOST OFF-LINE state is active, the host may request that it transition to ON-LINE. The combination of these two allows the host to cycle the equipment between ON-LINE and OFF-LINE.

Only the operator may change the ON-LINE substate (REMOTE or LOCAL).

4.16.3   Scenarios

4.16.3.1   Host Accepts ON-LINE

COMMENT	HOST	EQUIPMENT	COMMENT
			Operator actuates ON-LINE switch when equipment OFF_LINE state is active.
		← S1, F1	Equipment request ON-LINE.
Host grants ON-LINE	S1, F2 →		
		← S6, F11	"Control State LOCAL (or REMOTE)" collection event.
Acknowledge	S6, F12 →		

4.16.3.2   Host Denies ON-LINE

COMMENT	HOST	EQUIPMENT	COMMENT
			Operator actuates ON-LINE switch when equipment OFF_LINE state is active.
		← S1, F1	Equipment requests ON-LINE.
Host denies ON-LINE	S1, F0 →		

4.16.3.3   Operator Sets OFF-LINE

COMMENT	HOST	EQUIPMENT	COMMENT
			Operator actuates OFF-LINE switch when equipment ON_LINE state is active.
		← S6, F11	"Equipment request OFF-LINE" event.
Acknowledge	S6, F12 →		

4.16.3.4   Operator Sets REMOTE

COMMENT	HOST	EQUIPMENT	COMMENT
			Operator sets switch from LOCAL to REMOTE.
		← S6, F11	"Control State REMOTE" event.
Acknowledge	S6, F12 →		

4.16.3.5   Operator Sets LOCAL

COMMENT	HOST	EQUIPMENT	COMMENT
			Operator sets switch from REMOTE to LOCAL.
		← S6, F11	"Control State LOCAL" event.
Acknowledge	S6, F12 →		

4.16.3.6   Host Sets OFF-LINE

COMMENT	HOST	EQUIPMENT	COMMENT
Host request OFF-LINE.	S1, F15 →		

			[IF] Equipment is OFF-LINE
		⬅ S1, F0	[THEN] Equipment does not process requests.
			[ELSE] Equipment ON-LINE
		⬅ S1, F16	Equipment acknowledges request and transitions to OFF-LINE.
		⬅ S6, F11	"Equipment OFF_LINE" event.
Acknowledge	S6, F12 ➔		
			[END_IF]

4.16.3.7   Host Sets ON-LINE

COMMENT	HOST	EQUIPMENT	COMMENT
Host requests ON-LINE	S1, F17 ➔		
			[IF] Equipment is HOST OFF-LINE state not active.
		⬅ S1, F18	[THEN] Equipment denies request (ONLACK = 0).
			[ELSE] Equipment HOST OFF-LINE state is active.
		⬅ S1, F18	Equipment acknowledges request (ONLACK = 0).
		⬅ S6, F11	"Control state LOCAL (or REMOTE)" event.
Acknowledge	S6, F12 ➔		
			[END_IF]

4.17 PV2

This section describes CIMConnect features related to PV2.

4.17.1   Alarm Functionality

PV2 Alarm-related functionality is controlled by SupportPV2 Equipment Constant. When this feature is enabled (SupportPV2 set to "U1 1") CIMConnect will not send Event reports for Set/Clear Alarm event reports if the Alarm is not enabled.

For PV2 equipment all Alarms should use the same Set event and the same Clear event, 2 events total for alarms.

4.17.2   Clock Functionality

PV2 extends GEM Clock functionality by adding support for Time formats defined by E148 standard. This functionality is enabled through TimeFormat and ExtendedTimeFormat Equipment Constant settings. To enable PV2 Clock format TimeFormat should be set to "U4 2" and ExtendedTimeFormat to "U1 1".

5   SECS-II MESSAGE SUMMARY

5.1   Control State Dependency

The equipment's Control State Model, as described in section 3.2, determines the availability of most SECS-II message communication. If the host sends an unavailable SECS-II message while the equipment is off-line, then the equipment will respond with a respective Sx, F0 message.

Control State	Description
On-line L, R	On-line local or remote
Any	Any control state
Off-line	Off-line equipment, host or on-line Attempt. It may be accepted while on-line, but has no meaning.
On-line R	On-line remote

5.2   Host Initiated

This section lists primary, host initiated SECS-II messages supported by the equipment.

Primary	Reply	Notes	Control State	Primary Description
Sx, Fy	Sx, F0		Off-line	Any host primary message that is rejected by equipment because equipment control state is off-line
S1, F1	S1, F2		On-line L, R	Are you there request
S1, F3	S1, F4		On-line L, R	Selected equipment status request
S1, F11	S1, F12		On-line L, R	Status variable name-list request
S1, F13	S1, F14		Any	Establish communication request
S1, F15	S1, F16		On-line L, R	Request off-line
S1, F17	S1, F18		Off-line	Request on-line
S1, F21	S1, F22		On-line L, R	Data Variable Namelist Request
S1, F23	S1, F24		On-line L, R	Collection Event Namelist Request
S2, F13	S2, F14		On-line L, R	Equipment constant request
S2, F15	S2, F16		On-line L, R	New equipment constant send
S2, F17	S2, F18		On-line L, R	Date and time request
S2, F21	S2, F22	A	On-line L, R	Remote command send
S2, F23	S2, F24		On-line L, R	Trace initialize send
S2, F25	S2, F26	A	On-line L, R	Loop-back diagnostic request
S2, F29	S2, F30		On-line L, R	Equipment constant name-list request
S2, F31	S2, F32		On-line L, R	Date and time send
S2, F33	S2, F34		On-line L, R	Define report
S2, F35	S2, F36		On-line L, R	Link event report
S2, F37	S2, F38		On-line L, R	Enable/disable event report
S2, F39	S2, F40		On-line L, R	Multi-block inquire
S2, F41	S2, F42		On-line R	Host command send
S2, F43	S2, F44		On-line L, R	Reset spooling request
S2, F45	S2, F46		On-line L, R	Define variable limit attributes
S2, F47	S2, F48		On-line L, R	Variable limit attribute request
S2, F49	S2, F50		On-line L, R	Enhanced remote command send
S5, F3	S5, F4		On-line L, R	Enable/disable alarm send
S5, F5	S5, F6		On-line L, R	List alarms request
S5, F7	S5, F8	A	On-line L, R	List enabled alarm request
S6, F15	S6, F16		On-line L, R	Event report request
S6, F19	S6, F20		On-line L, R	Individual report request
S6, F23	S6, F24		On-line L, R	Request spooled data
S7, F1	S7, F2		On-line L, R	Process program load inquire
S7, F3	S7, F4		On-line L, R	Process program send
S7, F5	S7, F6		On-line L, R	Process program request
S7, F17	S7, F18		On-line L, R	Delete process program send
S7, F19	S7, F20		On-line L, R	Current EPPD request
S10, F3	S10, F4		On-line L, R	Terminal display, single
S10, F5	S10, F6		On-line L, R	Terminal display, multi-block

5.3   Equipment Initiated

This section lists primary, equipment initiated SECS-II messages supported by the equipment.

Primary	Reply	Notes	Primary Description
S1, F1	S2, F2		Are you there request
S1, F13	S1, F14		Establish communication request
S2, F17	S2, F18		Date and time request
S5, F1	S5, F2	W5	Alarm report send
S6, F1	S6, F2	W6	Trace data send
S6, F3	S6, F4	A, W6	Discrete variable data send
S6, F5	S6, F6		Multi-block data send inquire
S6, F11	S6, F12	W6	Event report send
S6, F13	S6, F14	A, W6	Annotated event report send
S7, F1	S7, F2		Process program load inquire
S7, F3	S7, F4		Process program send
S7, F5	S7, F6		Process program request
S9, F1	None		Unrecognized device ID
S9, F3	None		Unrecognized stream type
S9, F5	None		Unrecognized function type
S9, F7	None		Illegal data
S9, F9	None		Transaction timer timeout
S9, F11	None		Data too long
S9, F13	None		Conversation timeout
S10, F1	S10, F2	W10	Terminal request
S10, F7	None		Multi-block not allowed

5.4   Notes

These notes describe special conditions about the message.

Key	Description
N	A supported SECS-II message that conflicts with the GEM standard. The "N" abbreviates Non-GEM.
A	A supported SECS-II message that does not conflict with the GEM standard. The "A" abbreviates Addition to GEM.
W5	Equipment constant WBitS5 determines whether or not the equipment expects the host to reply.
W6	Equipment constant WBitS6 determines whether or not the equipment expects the host to reply.
W10	Equipment constant WBitS10 determines whether or not the equipment expects the host to reply.

6   DATA ITEM DEFINITION TABLE

Variable	Description	Values
ABS	Any binary string	
ACKA	Indicates success of a request:	TRUE is successful else FALSE
ACKC5	Acknowledge code	0 = Accepted > 0 = Error, not accepted 1-63 Reserved
ACKC6	Acknowledge code	0 = Accepted > 0 = Error, not accepted 1-63 Reserved
ACKC7	Acknowledge code	0 = Accepted 1 = Permission not granted 2 = Length error 3 = Matrix overflow 4 = PPID not found 5 = Mode unsupported 6-63 Reserved
ACKC10	Acknowledge code	0 = Accepted for display 1 = Message will not be displayed 2 = Terminal not available 3-63 Reserved
ALCD	Alarm code byte	bit 8 = 1 Alarm set bit 8 = 0 Alarm clear bit 7-1 Alarm category, not used
ALED	Alarm enable/disable code	bit 8 = 1 Enable alarm bit 8 = 0 Disable alarm
ALID	Alarm identification. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294	
ALTX	Alarm text limited to 40 characters	
ATTRDATA	Contains a specific attribute value for a specific object	
ATTRID	Identifier for an attribute for a specific type of object	
ATTRRELN	The relationship that a specified qualifying value has to the value of an attribute of an object instance (the value of interest):	0= The qualifying value is equal to the value of interest, 1 = The qualifying value is not equal to the value of interest, 2= The qualifying value is less than the value of interest, 3= The qualifying value is less than or equal to the value of interest, 4= The qualifying value is greater than the value of interest, 5 = The qualifying value is greater than or equal to the value of interest, 6= The qualifying value is present (contained in the set of) the value of interest, 7= The qualifying value is absent (not contained in the set of) the value of interest, >7 = Reserved.
CAACK	Carrier Action Acknowledge Code, 1 byte	0 = Acknowledge, command has been performed. 1 = Invalid command 2 = Can not perform now 3 = Invalid data or argument

		4 = Acknowledge, request will be performed with completion signaled later by an event. 5 = Rejected. Invalid state. 6 = Command performed with errors. 7-63 Reserved.
CARRIERACTION	Specifies the action requested for a carrier	
CARRIERID	The identifier of a carrier	
CARRIERSPEC	The object specifier for a carrier. Conforms to OBJSPEC.	
CATTRDATA	The value of a carrier attribute	
CATTRID	The name of a carrier attribute	
CEED	Collection event enable/disable code	FALSE = Disable TRUE = Enable
CEID	Collected event ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.	
COMMACK	Establish communications acknowledge code	0 = Accepted 1 = Denied 2-63 Reserved
CPACK	Command parameter acknowledge code	1 = Parameter Name (CPNAME does not exist 2 = Illegal value specified for CPVAL 3 = Illegal format specified by CPVAL >3 Other equipment-specific error 4-63 Reserved
CPNAME	Command parameter name	
CPVAL	Command parameter value	
CTLJOBCMD	Control Job command codes are assigned as follows:	1 = CJStart 2 = CJPause 3 = CJResume 4 = CJCancel 5 = CJDeselect 6 = CJStop 7 = CJAbort 8 = CJHOQ
CTLJOBID	Identifier for Control Job. Conforms to OBJID.	
DATA	A vector or string of unformatted data.	
DATAID	Data ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.	
DATALENGTH	Total bytes to be sent	
DATASEG	Used to identify the data requested.	
DRACK	Define report acknowledge code	0 = Accept 1 = Denied, insufficient space 2 = Denied, invalid format 3 = Denied, at least one RPTID already defined 4 = Denied, at least VID does not exist. >4 Other errors 5-63 Reserved
DSPER	Data sample period	hhmmss, 6 bytes or hhmmsscc, 8 bytes

EAC	Equipment acknowledge code	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 4-63 Reserved
ECDEF	Equipment constant default value	
ECID	Equipment constant ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.	
ECMAX	Equipment constant maximum value	
ECMIN	Equipment constant minimum value	
ECNAME	Equipment constant name	
ECV	Equipment constant value	
EDID	Expected data identification	Possible responses: MEXP EDID EDID S07F03 <PPID> A[16]
ERACK	Enable/disable event report	0 = Accepted 1 = Denied >1 Other errors 2-63 Reserved
ERRCODE	Code identifying an error	0 = No error 1 = Unknown object in Object Specifier 2= Unknown target object type 3 = Unknown object instance 4 = Unknown attribute name 5 = Read-only attribute - access denied 6 = Unknown object type 7 = Invalid attribute value 8 = Syntax error 9 = Verification error 10 = Validation error 11 = Object identifier in use 12 = Parameters improperly specified 13 = Insufficient parameters specified 14 = Unsupported option requested 15 = Busy 16 = Not available for processing 17 = Command not valid for current state 18 = No material altered 19 = Material partially processed 20 = All material processed 21 = Recipe specification related error 22 = Failed during processing 23 = Failed while not processing 24 = Failed due to lack of material 25 = Job aborted 26 = Job stopped 27 = Job cancelled 28 = Cannot change selected recipe 29 = Unknown event 30 = Duplicate report ID 31 = Unknown data report 32 = Data report not linked 33 = Unknown trace report 34 = Duplicate trace ID 35 = Too many data reports

		36 = Sample period out of range 37 = Group size to large 38 = Recovery action currently invalid 39 = Busy with another recovery currently unable to perform the recovery 40 = No active recovery action 41 = Exception recovery failed 42 = Exception recovery aborted 43 = Invalid table element 44 = Unknown table element 45 = Cannot delete predefined 46 = Invalid token 47 = Invalid parameter 48 = Load port does not exist 49 = Load port already in use 50 = Missing Carrier 51-63 = Reserved (data formats 51, 52, 54, or 50 must be used) 64-32767 = User defined (data formats 52, 54, or 50 must be used) formats 52, 54, or 50 must be used) 32768 = Action will be performed at earliest opportunity 32769 = Action can not be performed now 32770 = Action failed due to errors 32771 = Invalid command 32772 = Client Already Connected 32773 = Duplicate ClientID 32774 = Invalid ClientType 32775 = IncompatibleVersions 32776 = Unrecognized ClientID (Client not currently connected) 32777 = Failed (Completed Unsuccessfully) 32778 = Failed (Unsafe) — External intervention required 32779 = Sensor-Detected Obstacle 32780 = Material Not Sent 32781 = Material Not Received 32782 = Material Lost 32783 = Hardware Failure 32784 = Transfer Cancelled 32785–32792 reserved for future use by SEMI E127 service requests. 32793-65335 Reserved (data formats 52, 54, or 50 must be used) 65536 or above = User defined data formats 54 or 50 must be used)
ERRTEXT	Text string describing the error noted in the corresponding ERRCODE. Limited to 120 characters maximum.	
FCNID	Function identification	
GRANT	Grant code	0 = Permission granted 1 = Busy, try again 2 = No space available 3 = Duplicate DATAID >3 Equipment specific error code 4-63 Reserved

GRANT6	Permission to send	0 =	Permission granted
		1 =	Busy, try again
		2 =	Not interested
		>2	Other errors
		3-63	Reserved
HCACK	Host command parameter acknowledge code	0 =	Acknowledge
		1 =	Command does not exist
		2 =	Cannot perform now
		3 =	At least one parameter is invalid
		4 =	Acknowledge, command will be performed with completion signaled later
		5 =	Rejected, already in the desired condition
		6 =	No such object exists
		7-63	Reserved
LENGTH	Length of the service program or process program in bytes. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.		
LIMITACK	Acknowledgment code for variable limit attribute set	1 =	LIMITID does not exist
		2 =	UPPERDB > LIMITMAX
		3 =	LOWERDB < LIMITMIN
		4 =	UPPERDB < LOWERDB
		5 =	Illegal format specified for UPPERDB or LOWERDB
		6 =	ASCII value cannot be translated to numeric
		7 =	Duplicate limit definition for this variable
		>7	Other equipment-specific error
		8-63	Reserved
LIMITID	The identifier of a specific limit in the set of limits (as defined by UPPERDB and LOWERDB) for a variable to which the corresponding limit attributes refer		
LIMITMAX	The maximum allowed value for the limit values of a specific variable. The equipment manufacturer should specify this value, which would typically coincide with the maximum value of the variable being monitored. The format must match that of the referenced variable.		
LIMITMIN	The minimum allowed value for the limit values of a specific variable. The equipment manufacturer should specify this value, which would typically coincide with the minimum value of the variable being monitored. The format must match that of the referenced variable.		
LINKID	Used to link a completion message with a request that an operation be performed.		

	LINKID is set to the value of RMOPID in the initial request except for the last completion message to be sent, where it is set to zero.	
LOCID	The logical identifier of a material location.	
LOWERDB	A variable limit attribute, which defines the lower boundary of the dead-band of a limit. The value applies to a single limit (*LIMITID) for a specified VID. Thus, UPPERDB and LOWERDB as a pair define a limit.	
LRACK	Link report acknowledge code	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 >5 Other errors 6-63 Reserved
LVACK	Variable limit definition, acknowledge code. Defines the error with limit attributes for the reference VID.	1 = Variable does not exist 2 = Variable has no limits capability 3 = Variable repeated in message 4 = Limit value error as described in LIMITACK 5-63 Reserved
MDLN	Equipment Model Type, 6 bytes max	
MEXP	Message expected	SXX, FYY X = stream Y = function
MF	Material format code 1 byte by Format 10	Items with format 10 will be encoded as follows: 1 = Quantities in wafers 2 = Quantities in cassette 3 = Quantities in die or chips 4 = Quantities in boats 5 = Quantities in ingots 6 = Quantities in leadframes 7 = Quantities in lots 8 = Quantities in magazines 9 = Quantities in packages 10 = Quantities in plates 11 = Quantities in tubes 12 = Quantities in waterframes 13 = Quantities in carriers 14 = Quantities in substrates 15-63 Reserved Items with format 20 will be a unit identifier for one of the special SECS generic units, as specified in § 12.
MHEAD	SECS message block header associated with message block in error	
MID	Material ID	80 Characters maximum
OBJACK	Acknowledge code:	0 = Successful completion of requested

		data 1 = Error >1 Reserved
OBJCMD	Specifies an action to be performed by an object:	0 = Reserved 1 = Attach to requestor 2 = Detach from requestor (requires authorization token) 3 = Reattach to requestor 4 = Set attributes (requires authorization token) >4 Reserved
OBJID	Identifier for an object	
OBJSPEC	A text string that has an internal format and that is used to point to a specific object instance. The string is formed out of a sequence of formatted substrings, each specifying an object's type and identifier. The substring format has the following four fields: object type, colon character ":", object identifier, greater-than symbol ">" where the colon character ":" is used to terminate an object type and the "greater than" symbol ">" is used to terminate an identifier field. The object type field may be omitted where it may be otherwise determined. The final ">" is optional.	
OBJTYPE	Identifier for a group or class of objects. All objects of the same type must have the same set of attributes available.	
OBJTOKEN	Token used for authorization	
OFLACK	Acknowledge code for OFF-LINE request	0 = OFF-LINE Acknowledge 1-63 Reserved
ONLACK	Acknowledge code for ON-LINE	0 = ON-LINE Accepted 1 = ON-LINE Not Allowed 2 = Equipment Already ON-LINE 3-63 Reserved
OPID	Operation ID. A unique integer generated by the requestor of an operation, used where multiple completion confirmations may occur.	
PARAMNAME	The name of a parameter in a request	
PARAMVAL	The value of the parameter named in PARAMNAME. Values that are lists are restricted to lists of single items of the same format type.	
PGRPACTION	The action to be performed a port group	
PORTACTION	The action to be performed on a port	
PORTGRPNAME	The identifier of a group of ports	
PPBODY	Process program body	

PPGNT	Process program grant status	0 = OK 1 = Already have 2 = No space 3 = Invalid PPID 4 = Busy, try later 5 = Will not accept >5 Other error 6-63 Reserved
PPID	Process program ID	
PREVENTID	Processing related event identification:	1 = Waiting for material 2 = Job state change
PRJOBID	Text string which uniquely identifies a process job	
PRJOBMILESTONE	Notification of Processing status shall have one of the following values:	1 = Job Setup 2 = Job Processing 3 = Job Processing Complete 4 = Job Complete 5 = Job Waiting for Start
PRMTRLORDER	Defines the order by which material in the process jobs material list will be processed. Possible values are assigned as follows:	1 = ARRIVAL – process whichever material first arrives 2 = OPTIMIZE – process in an order that maximizes throughput 3 = LIST – follow the order in the list
PRPAUSEEVENT	The list of event identifiers, which may be sent as an attribute value to a process job. When a process job encounters one of these events it will pause, until it receives the PRJobCommand RESUME.	
PRPROCESSSTART	Indicates that the process resource start processing immediately when ready:	TRUE = Automatic Start FALSE = Manual Start
PRRECIPEMETHOD	Indicates the recipe specification type, whether tuning is applied and which method is used:	1 – Recipe only 2 – Recipe with variable tuning
PRSTATE	Enumerated value, 1 byte	
PTN	Material Port number, 1 byte	
RCPPARNM	The name of a recipe variable parameter. Maximum length of 256 characters.	
RCPPARVAL	The initial setting assigned to a recipe variable parameter. Text form restricted to maximum of 80 characters.	
RCPSPEC	Recipe specifier. The object specifier of a recipe.	
REPGSZ	Reporting group size. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.	
RPTID	Report ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.	
RSDA	Request spool data acknowledge	0 = OK 1 = Denied, busy, try later 2 = Denied, spooled data does not exist 3-63 Reserved
RSDC	Request spool data code	0 = Transmit spooled messages 1 = Purge spooled messages

		2-63	Reserved
RSPACK	Reset spooling acknowledge	0 =	Acknowledge, spooling setup accepted
		1 =	Spooling setup rejected
		2-63	Reserved
SHEAD	Stored header related to the transaction timer		
SLOTID	Used to reference material by slot (a position that holds material/substrates) in a carrier. This item may be implemented as an array in some messages.		
SMPLN	Sample number		
SOFTREV	Software revision code 6 bytes maximum		
SPNAME	Service parameter name defined in specific standard. If service parameter is defined as an object attribute, this is completely the same as ATTRID except format restrictions above.		
SPVAL	Service parameter value, corresponding to SPNAME. If service parameter is defined as an object attribute, this is completely the same as ATTRDATA except format restrictions for the attribute.		
STIME	Sample time	same as TME	
STRID	Stream identification		
SV	Status variable value		
SVCACK	Service acceptance acknowledge code, 1 byte	0 = Acknowledge, service has been performed 1 = Service does not exist 2 = Cannot perform now 3= At least parameter is invalid 4 = Acknowledge, service will be performed with completion notified later with parameters for response 5 = Service is not completed or prohibited 6 = No such object exists 7-63 Reserved	
SVID	Status variable ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.		
SVNAME	Status variable name		
TARGETSPEC	Object specifier of target object		
TEXT	A single line of characters.		
TIAACK	Equipment acknowledgment code	0 =	Everything correct
		1 =	Too many SVID
		2 =	No more traces allowed
		3 =	Invalid period
		4 =	Unknown SVID specified
		5 =	Invalid REPGSZ or when it is outside of 1..262144 range
		6-63	Reserved

		64 =	Unknown error creating trace. Possible errors include; No variables listed, Invalid TRID, or TOTSMP = 0.
		66 =	At least one variable is of List type or estimated message size > 244 bytes(only occurs when TraceReportMultiBlock=0)
TIACK	Time acknowledge code	0 =	OK
		1 =	Error, not done
		2-63	Reserved
TID	Terminal number		
TIME	Time of day	If 12 bytes the format is YYMMDDhhmmss YY = year 00 to 99 MM = month 01 to 12 DD = day 01 to 31 hh = hour 00 to 23 mm = minute 00 to 59 ss = second 00 to 59 If 16 bytes the format is YYYYMMDDhhmmsscc YYYY = year 0000 to 9999 MM = month 01 to 12 DD = day 01 to 31 hh = hour 00 to 23 mm = minute 00 to 59 ss = second 00 to 59 cc = centisecond 00 to 99 If Extended the format is YYYY-MM-DDThh:mm:ss.sTZD YYYY = year 0000 to 9999 MM = month 01 to 12 DD = day 01 to 31 T = Special separator character ("T") used between date and time hh = hour 00 to 23 mm = minute 00 to 59 ss = second 00 to 59 s = One or more digits representing a fraction of a second TZD = time zone designator "Z" (for UTC) or +/-hh:mm (for offset from UTC to local time)		
TIMESTAMP	Timestamp in 12, 16 bytes, or Extended format indicating the time of an event, which encodes time as specified by the TimeFormat equipment constant value setting.	Where: 12-byte format YYMMDDhhmmss 16-byte format YYYYMMDDhhmmsscc Extended (max 32 byte) format YYYY-MM-DDThh:mm:ss.sTZD (see SEMI E148) See TimeFormat equipment constant variable item in Table 4 for additional detail on the formats.	
TOTSMP	Total samples to be made. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.		

TRID	Trace request ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.		
UNITS	Units Identifier		
UPPERDB	A variable limit attribute that defines the upper boundary of the dead-band of a limit. The value applies to a single limit (LIMITID) for a specified VID. Thus, UPPERDB and LOWERDB as a pair define a limit.		
V	Variable data		
VID	Variable ID. U1-U8, I1-I8, F4, F8 formats will be accepted as long as the value is between 0 and 4294967294.		
VLAACK	Variable Limit Attribute Acknowledge Code	0 = 1 = 2 = >2 3-63	Acknowledge, command will be performed. Limit attribute definition error Cannot perform now Equipment-specific error Reserved

A, Bi, Bo, F4, F8, I1, I2, I4, U1, U2, U4

7   STREAMS AND FUNCTIONS

The sections below describe the subset of SECS-II message streams and their included functions that are supported by the interface. It can be seen that the odd numbered functions within each stream are requests and the subsequent, even numbered functions are the corresponding response.

Symbol	Description
H⇔E	Host to equipment or equipment to host
H←E	Equipment to host only
H→E	Host to equipment only

7.1   Stream 1: Equipment Status

7.1.1   S1, F1 Are You There Request (H⇔E)

Establishes that the SECS-II link is operational and that the host and machine are on-line. The machine responds with its model number and software revision. The host responds with a null list. The equipment may use this message when using SECS-I as a "heartbeat" to detect communication failures. The equipment also uses this message in the Control State model when attempting to go online.

```
Header only
```

7.1.2   S1, F2 On-line Data (H←E)

```
L, 2
      1. <A MDLN>
      2. <A SOFTREV>
```

7.1.3   S1, F2 On-line Data (H→E)

```
L, 0
```

7.1.4   S1, F3 Selected Equipment Status Request (H→E)

This message is a request from the host to report the values of certain status variables in a predefined order.

```
L, n
      1. <U4 SVID>
      …
      n. <U4 SVID>
```

- A zero-length list means report all SVID.

7.1.5   S1, F4 Selected Equipment Status Data (H←E)

```
L, n
      1. <* SV>
      n. <* SV>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, U8

- A zero-length U1 for SV means that the SVID does not exist.

7.1.6   S1, F11 Status Variable Namelist Request (H→E)

A request from the host to the machine to report the name and units of certain status variables, in the order requested.

```
L, n
      1. <U4 SVID>
      …
      n. <U4 SVID>
```
- A zero-length list means report all SVID.

7.1.7   S1, F12 Status Variable Namelist Reply (H←E)

```
L, n
      1. L, 3
            1. <U4 SVID>
            2. <A SVNAME>
```

```
                3. <A UNITS>
          …
        n. L, 3
                1. <U4 SVID>
                2. <A SVNAME>
                3. <A UNITS>
```

7.1.8   S1, F13 Establish Communications Request (H➔E)

Initiate an attempt to establish a SECS-II communications link at a logical level on power-up or after a break in the link. It is the first message sent after either of the above conditions.

```
L, 0
```

7.1.9   S1, F14 Establish Communications Request Acknowledge (H➔E)

```
L, 2
        1. <Bi COMMACK>
        2. L, 0
```

7.1.10   S1, F13 Establish Communications Request (H⬅E)

Initiate an attempt to establish a SECS-II communications link at a logical level on power-up or after a break in the link. It is the first message sent after either of the above conditions. If no response is received from the host, the machine will periodically send a S1F13 message until a S1F14 with the correct COMMACK is received.

```
L, 2
        1. <A MDLN>
        2. <A SOFTREV>
```

7.1.11   S1, F14 Establish Communications Request Acknowledge (H⬅E)

```
L, 2
        1. <Bi COMMACK>
        2. L, 2
                1. <A MDLN>
                2. <A SOFTREV>
```

7.1.12   S1, F15 Off-line Control State Request (H➔E)

The host requests that the equipment transition to the OFF-LINE state.

```
Header only
```

7.1.13   S1, F16 Off-line Control State Acknowledge (H⬅E)

```
<Bi OFLACK>
```

7.1.14   S1, F17 On-line Control State Request (H➔E)

The host requests that the equipment transition to the ON-LINE state.

```
Header only
```

7.1.15   S1, F18 On-line Control State Acknowledge (H⬅E)

```
<Bi ONLACK>
```

7.1.16   S1, F21 Data Variable Namelist Request (H➔E)

A request from the host to the machine to report the name and units of certain data variables, in the order requested.

```
L, n
        1. <U4 VID>
          …
        n. <U4 VID>
```

- A zero-length list means report all DVID.

7.1.17   S1, F22 Data Variable Namelist Reply (H←E)

```
L, n
      1. L, 3
            1. <U4 VID>
            2. <A DVVALNAME>
            3. <A UNITS>
      …
      n. L, 3
            1. <U4 VID>
            2. <A DVVALNAME>
            3. <A UNITS>
```

```
Zero-length ASCII items for both DVVALNAME and UNITS indicates that VID doesn't
exist or is not the identifier of a DVVAL class variable.
```

7.1.18   S1, F23 Collection Event Namelist Request (H→E)

A request from the host to the machine to report the name and the list of associated data variables for certain collection events, in the order requested.

```
L, n
      1. <U4 CEID>
      …
      n. <U4 CEID>
```
- A zero-length list means report all CEIDs.

7.1.19   S1, F24 Collection Event Namelist Reply (H←E)

```
L, n
      1. L, 3
            1. <U4 CEID>
            2. <A CENAME>
            3. L, a
                  1. <U4 VID>
                  …
                  a. <U4 VID>
      …
      n. L, 3
            1. <U4 CEID>
            2. <A CENAME>
            3. L, b
                  1. <U4 VID>
                  …
                  b. <U4 VID>
```

When both CENAME and the list of associated VIDs are zero-length items, this indicates the CEID does not exist.

7.2   Stream 2: Equipment Control and Diagnostics

7.2.1   S2, F13 Equipment Constant Request (H→E)

A request from the host to report the value of certain equipment constants in a predefined order.
```
L, n
      1. <U4 ECID>
      …
      n. <U4 ECID>
```
- A zero-length list or item means report all ECID.

7.2.2   S2, F14 Equipment Constant Data (H←E)

```
L, n
      1. <* ECV>
      …
```

```
        n. <* ECV>
```

* A, Bi, Bo, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

- A zero-length list item for ECV means that ECID does not exist.

7.2.3   S2, F15 New Equipment Constant Send (H➔E)

Host updates the values of specified EC. If the host returns a non-zero EAC the equipment will not change the value of any ECID specified in the S2F15 body.

```
L, n
        1. L, 2
                <U4 ECID>
                <* ECV>
        …
        n. L, 2
                <U4 ECID>
                <* ECV>
```

* A, Bi, Bo, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

7.2.4   S2, F16 New Equipment Constant Acknowledge (H←E)

```
<Bi EAC>
```

7.2.5   S2, F17 Date and Time Request (H⇔E)

The host and machine synchronize time-stamps.

```
Header Only
```

7.2.6   S2, F18 Date and Time Data (H⇔E)

```
<A TIME>
```
- A zero-length item means no time exists.

7.2.7   S2, F21 Remote Command Send (H➔E)

The host requests equipment to perform an action.
```
<A RCMD>
```

7.2.8   S2, F22 Remote Command Acknowledge (H←E)

```
<U1 CMDA>
```

7.2.9   S2, F23 Trace Initialize Send (H➔E)

The host requests a time driven trace of specified status variables. If TOTSMP is zero, the machine will cancel an existing trace with the given TRID.
```
L, 5
        1. <U4 TRID>
        2. <A DSPER>
        3. <U4 TOTSMP>
        4. <U4 REPGSZ>
        5. L, n
                1. <U4 SVID>
                …
                n. <U4 SVID>
```

7.2.10   S2, F24 Trace Initialize Acknowledge (H←E)

```
<Bi TIAACK>
```

7.2.11   S2, F25 Loop-back Diagnostic Request (H⇔E)

A diagnostic message for checkout of protocol and communication circuits. The message sent is echoed back.
```
<* ABS>
```

* Any structure is valid except a "HEADER ONLY" message.

7.2.12   S2, F26 Loop-back Diagnostic Data (H⇔E)

```
<* ABS>
```

* The same structure is returned.

7.2.13   S2, F29 Equipment Constant Namelist Request (H➔E)

A request from the host to the equipment to retrieve information regarding the specified equipment constants. A zero length list (n = 0) means to send information for all ECID.

```
L, n
       1. <U4 ECID>
       …
       n. <U4 ECID>
```

• A zero-length list means to send information for all ECID.

7.2.14   S2, F30 Equipment Constant Namelist (H⬅E)

```
L, n
       1. L, 6
              1. <U4 ECID>
              2. <A ECNAME>
              3. <* ECMIN>
              3. <* ECMAX>
              3. <* ECDEF>
              3. <A UNITS>
       …
       n. L, 6
              1. <U4 ECID>
              2. <A ECNAME>
              3. <* ECMIN>
              3. <* ECMAX>
              3. <* ECDEF>
              3. <A UNITS>
```

Zero length ASCII items for ECNAME, ECMIN, ECMAX, ECDEF and UNITS indicates that the ECID does not exist.

* A, Bi, Bo, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

7.2.15   S2, F31 Date and Time Set Request (H➔E)

The host instructs the equipment to set its time base to the specified value.

```
<A TIME>
```

Note that setting the time on a machine configured to follow Daylight Savings Time may have unexpected results in the following two cases.

• target time between 2 AM and 3AM on the day the clock is to be adjusted to daylight time. 2AM to 2:59:59 AM does not exist on this day, yet you can set the clock to this time.

• target time between 1AM and 2AM on the day the clock is to be adjusted to standard time. 1AM to 2AM repeats twice on this day and there is no way to specify which occurrence the target is when setting the clock.

7.2.16   S2, F32 Date and Time Set Acknowledge (H⬅E)

```
<Bi TIACK>
```

7.2.17   S2, F33 Define Report (H➔E)

A request from the host for the machine to define a group of event reports. One or more Report IDs is specified, each containing a list of variable IDs to be included in the report.

```
L, 2
       1. <U4 DATAID>
       2. L, a
              1. L, 2
```

```
                                   1. <U4 RPTID>
                                   2. L, b
                                          1. <U4 VID>
                                          …
                                          b. <U4 VID>
                      …
                      a. L, 2
                            1. <U4 RPTID>
                            2. L, c
                                   1. <U4 VID>
                                   …
                                   c. <U4 VID>
```

- A zero-length list following DATAID deletes all report definitions and associated links. See S2, F35.

- A zero-length list following RPTID deletes report type RPTID. All CEID links to this RPTID are also deleted.

7.2.18 S2, F34 Define Report Acknowledge (H←E)

`<Bi DRACK>`

7.2.19 S2, F35 Link Event Report (H→E)

The host links Report IDs (RPTID) to Collection event IDs (CEID). These linked event reports 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 events.

```
L, 2
      1. <U4 DATAID>
      2. L, a
            1. L, 2
                   1. <U4 CEID>
                   2. L, b
                          1. <U4 RPTID>
                          …
                          b. <U4 RPTID>
            …
            a. L, 2
                   1. <U4 CEID>
                   2. L, c
                          1. <U4 RPTID>
                          …
                          c. <U4 RPTID>
```

- A zero-length list following CEID deletes all report links to that event.

- The SEMI E5 standard is ambiguous as to the behavior of a zero-length list following DATAID. It has been interpreted to be an invalid condition. The S2F36 reply message will have an LRACK value of 2.

7.2.20 S2, F36 Link Event Report Acknowledge (H←E)

`<Bi LRACK>`

7.2.21 S2, F37 Enable/Disable Event Report (H→E)

Host requests to enable or disable reporting for a list of Collection events (CEID).

```
L, 2
      1. <Bo CEED>
      2. L, n
             1. <U4 CEID>
             …
             n. <U4 CEID>
```

- A zero-length list (n = 0) means all CEID.

7.2.22   S2, F38 Enable/Disable Event Report Acknowledge (H←E)

```
<Bi ERACK>
```

7.2.23   S2, F39 Multi-Block Inquire (H→E)

The host initiates this transaction preceding a multi-block S2, F33 or S2, F35.

```
L, 2
      1. <U4 DATAID>
      2. <U4 DATALENGTH>
```

7.2.24   S2, F40 Multi-Block Grant (H←E)

```
<Bi GRANT>
```

7.2.25   S2, F41 Host Command Send (H→E)

The host sends a request to the equipment to perform the specified command with the relevant parameters.
Note: a detailed list of remote commands is provided in the "Remote Commands" section.

```
L, 2
      1. <A RCMD>
      2. L, n
            1. L, 2
                  1. <A CPNAME>
                  2. <* CPVAL>
            …
            n. L, 2
                  1. <A CPNAME>
                  2. <* CPVAL>
```

* A, Bi, Bo, L, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

7.2.26   S2, F42 Host Command Acknowledge (H←E)

```
L, 2
      1. <Bi HCACK>
      2. L, n
            1. L, 2
                  1. <A CPNAME>
                  2. <Bi CPACK>
            …
            n. L, 2
                  1. <A CPNAME>
                  2. <Bi CPACK>
```

- If there are no invalid parameters, then a list of zero length will be sent for item 2 (n = 0).

7.2.27   S2, F43 Reset Spooling Streams and Functions (H→E)

The host can use this message to select specific streams and functions to be spooled whenever spooling is active.

```
L, m
      1. L, 2
            1. <U1 STRID>
            2. L, n
                  1. <U1 FCNID>
                  …
                  n. <U1 FCNID>
      …
      m. L, 2
            1. <U1 STRID>
            2. L, n
                  1. <U1 FCNID>
                  …
```

```
                        n. <U1 FCNID>
```

- 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

- 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.

- All other primary messages for a stream are allowed.

- A defined list of functions for a stream in this message will replace any previously selected functions.

7.2.28 S2, F44 Reset Spooling Acknowledge (H←E)

```
L, 2
      1. <Bi RSPACK>
      2. L, m                 (m = number of streams with errors)
            1. L, 3
                  1. <U1 STRID>
                  2. <Bi STRACK>
                  3. L, n              (n = number of functions in error)
                        1. <U1 FCNID>
                        …
                        n. <U1 FCNID>
            …
            m. L, 3
                  1. <U1 STRID>
                  2. <Bi STRACK>
                  3. L, n
                        1. <U1 FCNID>
                        …
                        n. <U1 FCNID>
```

- If RSPACK = 0, then a zero-length list, m = 0, is given. This indicates no streams or functions are in error.

- A zero-length list, n = 0, indicates no functions in error for specified streams.

7.2.29 S2, F45 Define Variable Limit Attributes (H→E)

```
L, 2
      1. <U4 DATAID>
      2. L, m
            1. L, 2
                  1. <U4 VID>
                  2. L, n
                        1. L, 2
                              1. <Bi LIMITID>
                              2. L, p = {0,2}
                                    1. <* UPPERDB>
                                    2. <* LOWERDB>
                        …
                        n. L, 2
                              1. <Bi LIMITID>
                              2. L, p = {0,2}
                                    1. <* UPPERDB>
                                    2. <* LOWERDB>
            …
            m. L, 2
                  1. <U4 VID>
                  2. L, n
                        1. L, 2
                              1. <Bi LIMITID>
                              2. L, p = {0,2}
                                    1. <* UPPERDB>
                                    2. <* LOWERDB>
```

```
                          …
                          n. L, 2
                                1. <Bi LIMITID>
                                2. L, p = {0,2}
                                        1. <* UPPERDB>
                                        2. <* LOWERDB>
```

* A, Bo, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

- A zero length list, m=0, sets all limit values for all monitored VID to "undefined".

- A zero length list, n=0, sets all limit values for that VID to "undefined".

- A zero length list, p=0, sets that limit to "undefined".

7.2.30   S2, F46 Variable Limit Attribute Acknowledge (H←E)

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.

```
L, 2
      1. <Bi VLACK>
      2. L, m        (m = number of invalid parameters)
            1. L, 3
                  1. <U4 VID>          (VID with error)
                  2. <Bi LVACK>        (reason)
                  3. L, n = {0,2}
                        1. <Bi LIMITID>      (1st limit in error for VID)
                        2. <Bi LIMITACK>     (reason)
                  …
            m. L, 3
                  1. <U4 VID>
                  2. <Bi LVACK>
                  3. L, n = {0,2}
                        1. <Bi LIMITID>
                        2. <Bi LIMITACK>
```

- A zero-length list, m = 0, indicates no invalid variable limit attributes.

- A zero-length list, n = 0, indicates no invalid limit values for that VID.

7.2.31   S2, F47 Variable Limit Attribute Request (H→E)

This message allows the host to query the equipment for current variable limit-attribute definitions.

```
L, m
      1. <U4 VID>
      …
      m. <U4 VID>
```

- A zero-length list, m = 0, requests a list of all VID values that can have variable limit attributes.

7.2.32   S2, F48 Variable Limit Attribute Send (H←E)

```
L, m
      1. L, 2
            1. <U4 VID>
            2. L, p = {0,4}
                  1. <A UNITS>
                  2. <* LIMITMIN>
                  3. <* LIMITMAX>
                  4. L, n
                        1. L, 3
                              1. <Bi LIMITID>
                              2. <* UPPERDB>
                              3. <* LOWERDB>
                        …
                        n. L, 3
```

```
                                        1. <Bi LIMITID>
                                        2. <* UPPERDB>
                                        3. <* LOWERDB>
        …
    m. L, 2
            1. <U4 VID>
            2. L, p = {0,4}
                    1. <A UNITS>
                    2. <* LIMITMIN>
                    3. <* LIMITMAX>
                    4. L, n
                            1. L, 3
                                        1. <Bi LIMITID>
                                        2. <* UPPERDB>
                                        3. <* LOWERDB>
                            …
                            n. L, 3
                                        1. <Bi LIMITID>
                                        2. <* UPPERDB>
                                        3. <* LOWERDB>
```

* A, Bo, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

- A zero-length list, p = 0, indicates that limits are not supported for the VID.

- A zero-length list, n = 0, means no limits are currently defined for the specified variable.

7.2.33   S2, F49 Enhanced Remote Command (H→E)

The host sends a request to the equipment to perform the specified command with the relevant parameters.
Note: a detailed list of remote commands is provided in the "Remote Commands" section.

```
L, 4
      1. <U4 DATAID>
      2. <A OBJSPEC>
      3. <A RCMD>
      4. L, m
            1. L, 2
                    1. <A CPNAME>
                    2. <* CEPVALUE>
            …
            m. L, 2
                    1. <A CPNAME>
                    2. <* CEPVALUE>
```

* A, Bi, Bo, F4, F8, I1, I2, I4, I8, U1, U2, U4, U8

7.2.34   S2, F50 Enhanced Remote Command Acknowledge (H←E)
```
L, 2
      1. <Bi HCACK>
      2. L, n
            1. L, 2
                    1. <A CPNAME>
                    2. <* CEPACK>
            …
            n. L, 2
                    1. <A CPNAME>
                    2. <* CEPACK>
```
* L, U1

7.3   Stream 5: Exception Reporting

7.3.1   S5, F1   Alarm Report Send (H←E)

This message is sent whenever an alarm changes states to "Set" or "Clear"
```
L, 3
      1. <Bi ALCD>
      2. <U4 ALID>
      3. <A ALTX>
```

7.3.2   S5, F2   Alarm Report Acknowledge (H→E)
```
<Bi ACKC5>
```

7.3.3   S5, F3   Enable/Disable Alarm Send (H→E)

This message enables or disables an alarm from being reported to the host. Some alarms (safety related) are not controllable in this way.
```
L, 2
      1. <Bi ALED>
      2. <U4 ALID>
```
- A zero-length item for ALID means all alarms.

7.3.4   S5, F4   Enable/Disable Alarm Acknowledge (H←E)
```
<Bi ACKC5>
```

7.3.5   S5, F5   List Alarms Request (H→E)

The host requests the equipment to send information on currently defined alarms.
```
L, n
      1. <U4 ALID>
      …
      n. <U4 ALID>
```

- A zero-length item (n = 0) means send all possible alarms regardless of the state of ALED.

7.3.6   S5, F6   List Alarms Data (H←E)

```
L, m
      1. L, 3
            1. <Bi ALCD>
            2. <U4 ALID>
            3. <A ALTX>
      …
      m. L, 3
            1. <Bi ALCD>
            2. <U4 ALID>
            3. <A ALTX>
```

- If m = 0, no response can be made. A zero-length item returned for ALCD or ALTX means that value does not exist.

7.3.7   S5, F7   List Alarms Request (H→E)

The host requests the equipment to send information on currently defined alarms.
```
Header only.
```

7.3.8   S5, F8   List Alarms Data (H←E)

```
L, m
```

```
              1. L, 3
                      1. <Bi ALCD>
                      2. <U4 ALID>
                      3. <A ALTX>
              …
              m. L, 3
                      1. <Bi ALCD>
                      2. <U4 ALID>
                      3. <A ALTX>
```

- If m = 0, no response can be made. A zero-length item returned for ALCD or ALTX means that value does not exist.

7.4   Stream 6: Data Collection

7.4.1   S6, F1   Trace Data Send (H←E)

Trace Samples configured with S2, F23 messages are sent to the host in these messages.

```
L, 4
        1. <U4 TRID>
        2. <U4 SMPLN>
        3. <A STIME>
        4. L, n
                1. <* SV>
                …
                n. <* SV>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, U8

- A zero-length STIME means no value is given and that the time is to be derived from SMPLN along with knowledge of the request.

7.4.2   S6, F2   Trace Data Acknowledge (H→E)

```
<Bi ACKC6>
```

7.4.3   S6, F3   Discrete Variable Data Send (H←E)

The machine sends a defined, event linked and enabled group of reports to the host on a linked event. This is a message that possibly requires a preceding S6, F5/F6 multi-block enquire/grant transaction.

```
L, 3
        1. <U4 DATAID>
        2. <U4 CEID>
        3. L, a
                1. L, 2
                        1. <U4 DSID>
                        2. L, b
                                1. L, 2
                                        1. <A DVNAME>
                                        2. <* DVVAL>
                                …
                                1. L, 2
                                        1. <A DVNAME>
                                        2. <* DVVAL>
                …
                a. L, 2
                        1. <U4 DSID>
                                1. L, 2
                                        1. <A DVNAME>
                                        2. <* DVVAL>
                                …
                                1. L, 2
```

```
                              1. <A DVNAME>
                              2. <* DVVAL>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, I8

- If there are no reports linked to the event a "null" report is assumed. A zero-length list for # of reports means there are no reports linked to the given CEID.

7.4.4   S6, F4   Discrete Variable Data Acknowledge (H→E)

```
<Bi ACKC6>
```

7.4.5   S6, F5   Multi-Block Data Send Inquire (H←E)

The machine initiates this transaction preceding a multi-block S6 report.

```
L, 2
      1. <U4 DATAID>
      2. <U4 DATALENGTH>
```

7.4.6   S6, F6   Multi-Block Grant (H→E)

```
<Bi GRANT6>
```

7.4.7   S6, F11 Event Report Send (H←E)

The machine sends a defined, event linked and enabled group of reports to the host on a linked event. This is a message that possibly requires a preceding S6, F5/F6 multi-block enquire/grant transaction.

```
L, 3
      1. <U4 DATAID>
      2. <U4 CEID>
      3. L, a
            1. L, 2
                    1. <U4 RPTID>
                    2. L, b
                          1. <*V>
                          …
                          b. <*V>
            …
            a. L, 2
                    1. <U4 RPTID>
                    2. L, c
                          1. <*V>
                          …
                          c. <*V>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, U8

- If there are no reports linked to the event a "null" report is assumed. A zero-length list for # of reports (a = 0) means there are no reports linked to the given CEID.

7.4.8   S6, F12 Event Report Acknowledge (H→E)

```
<Bi ACKC6>
```

7.4.9   S6, F13 Annotated Event Report Send (H←E)

The machine sends a defined, event linked and enabled group of reports to the host on a linked event. This is a message that possibly requires a preceding S6, F5/F6 multi-block enquire/grant transaction.

```
L, 3
      1. <U4 DATAID>
      2. <U4 CEID>
      3. L, a
```

```
1. L, 2
      1. <U4 RPTID>
      2. L, b
            1. L, 2
                  1. <A VID>
                  2. <* V>
            …
            1. L, 2
                  1. <A VID >
                  2. <* V>
…
a. L, 2
      1. <U4 RPTID >
            1. L, 2
                  1. <A VID >
                  2. <* V>
            …
            1. L, 2
                  1. <A VID >
                  2. <* V>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, U8

- If there are no reports linked to the event a "null" report is assumed. A zero-length list for # of reports (a = 0) means there are no reports linked to the given CEID.

7.4.10   S6, F14 Annotated Event Report Acknowledge (H➔E)

`<Bi ACKC6>`

7.4.11   S6, F15 Event Report Request (H➔E)

The host requests event report data for a specified CEID.

`<U4 CEID>`

7.4.12   S6, F16 Event Report Data (H⬅E)

Equipment sends reports linked to given CEID to host.

```
L, 3
      1. <U4 DATAID>
      2. <U4 CEID>
      3. L, a
            1. L, 2
                  1. <U4 RPTID>
                  2. L, b
                        1. <* V>
                        …
                        b. <* V>
            …
            a. L, 2
                  1. <U4 RPTID>
                  2. L, c
                        1. <* V>
                        …
                        c. <* V>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, U8

- A zero-length item (a = 0) means there are no reports linked to the given CEID.

7.4.13   S6, F19 Individual Report Request (H➔E)

The host requests a defined report from the equipment.

`<U4 RTPID>`

7.4.14   S6, F20 Individual Report Data (H←E)

Equipment sends variable data defined for the given RPTID to the host.

```
L, n
      1. <* V>
      …
      n. <* V>
```

* A, Bi, Bo, F4, F8, L, I1, I2, I4, I8, U1, U2, U4, U8

- A zero-length list (n = 0) means RPTID is not defined.

7.4.15   S6, F23 Request Spooled Data (H→E)

Host requests transmission or deletion of messages currently spooled by the equipment.

```
<U1 RSDC>
```

7.4.16   S6, F24 Request Spooled Data Acknowledgement Send (H←E)

```
<Bi RSDA>
```

7.5   *Stream 7: Process Program Management*

If you are using binary files, then you must change all PPBODY references to type "Bi".

7.5.1   S7, F1   Process Program Load Inquire (H⇔E)

This message is used to initiate the transfer of a process program.

```
L, 2
      1. <A PPID>
      2. <U4 LENGTH>
```

7.5.2   S7, F2   Process Program Load Grant (H⇔E)

```
<Bi PPGNT>
```

7.5.3   S7, F3   Process Program Send (H⇔E)

The purpose of this message is to send the process program.

```
L, 2
      1. <A PPID>
      2. <A PPBODY>
```

7.5.4   S7, F4   Process Program Acknowledge (H⇔E)

```
<Bi ACKC7>
```

7.5.5   S7, F5   Process Program Request (H⇔E)

This message is used to request the transfer of a process program.

```
<A PPID>
```

7.5.6   S7, F6   Process Program Data (H⇔E)

This message is used to transfer a process program.

```
L, 2
      1. <A PPID>
      2. <A PPBODY>
```

- A zero-length list means request denied.

7.5.7   S7, F17 Delete Process Program Send (H➔E)

This message is used by the host to request the deletion of a process program.

```
L, n
        1. <A PPID>
        …
        n. <A PPID>
```

7.5.8   S7, F18 Delete Process Program Acknowledge (H⬅E)

```
<Bi ACKC7>
```

7.5.9   S7, F19 Current EPPD Request (H➔E)

This message is used by the host to request the name of the process program directory (EPPD) in use.

```
Header only
```

7.5.10   S7, F20 Current EPPD Data (H⬅E)

```
L, n
        1. <A PPID>
        …
        n. <A PPID>
```

7.6   Stream 9: System Errors

7.6.1   S9, F1   Unrecognized Device ID (H⬅E)

Device ID specified in block header is not defined in the machine.

```
<Bi MHEAD>
```

7.6.2   S9, F3   Unrecognized Stream Type (H⬅E)

Machine does not recognize the stream type in the message block header.

```
<Bi MHEAD>
```

7.6.3   S9, F5   Unrecognized Function Type (H⬅E)

Machine does not recognize the function type in the message block header.

```
<Bi MHEAD>
```

7.6.4   S9, F7   Illegal Data (H⬅E)

This error signifies that the stream and function were correctly interpreted but the associated data was not.

```
<Bi MHEAD>
```

7.6.5   S9, F9   Transaction Timer Timeout (H⬅E)

This error specifies that a transaction / receive timer has timed out and the transaction aborted. The host system should respond to this message in a suitable manner to keep the system operational.

```
<Bi SHEAD>
```

7.6.6   S9, F11 Data Too Long (H⬅E)

The machine has been sent more data than it can handle.

```
<Bi MHEAD>
```

7.6.7   S9, F13 Conversation Timeout (H⬅E)

Machine informs host that data was expected, but none was received within time period given.

```
L, 2
        1. <A MEXP>
        2. <A EDID>
```

7.7   Stream 10: Terminal Services

7.7.1   S10, F1 Terminal Request (H←E)

A terminal text message to the host.

```
L, 2
      1. <Bi TID>
      2. <A TEXT>
```

7.7.2   S10, F2 Terminal Request Acknowledge (H→E)

`<Bi ACKC10>`

7.7.3   S10, F3 Terminal Display (Single) (H→E)

The host requests a text message be displayed on the machine.

```
L, 2
      1. <Bi TID>
      2. <A TEXT>
```

7.7.4   S10, F4 Terminal Display (Single) Acknowledge (H←E)

`<Bi ACKC10>`

7.7.5   S10, F5 Terminal Display, Multi-Block (H→E)

The host requests a multi-block text message be displayed on the machine.

```
L, 2
      1. <Bi TID>
      2. L, n
             1. <A TEXT>
             …
             n. <A TEXT>
```

7.7.6   S10, F6 Terminal Display, Multi-Block Acknowledge (H←E)

`<Bi ACKC10>`

7.7.7   S10, F7 Multi-Block Not Allowed (H←E)

Equipment sends an error message from a terminal that cannot handle a multi-block message from S10, F5
`<Bi TID >`

8 APPENDIX

8.1 Communication Setup

8.1.1 HSMS-SS Configuration

Parameter	Description	Range	Resolution	Typical value
Network hardware				
Device ID	The device-id identifies the equipment and will be assigned by the factory.	0 to 32767	1	32767
IP Address	If PASSIVE, then the IP address will must be localhost and the TCP port will be the port you want the host to connect to. If ACTIVE, the IP address will be the name or dotted integer format IP address of the host machine and the TCP port will be the host port for the equipment to connect to.			127.0.0.1
TCP Port	The TCP port number.			6000
Active or Passive	The equipment must be configured to be a PASSIVE or ACTIVE connection. Usually, a PASSIVE connection is preferred for the equipment side.	PASSIVE or ACTIVE		PASSIVE
T3	The T3 timeout is the transaction timer. This is the maximum amount of time between a primary message and the expected response before declaring the transaction closed. If the timer expires, an S9F9 error message is sent if AUTOS9F9 is specified.	1 – 120 seconds	1 msec	45 seconds
T5	The T5 timeout is the connect separation timeout. This is the amount of time which must elapse between successive attempts to actively establish a connection.	1 – 240 seconds	1 msec	5 seconds
T6	The T6 timeout is the control transaction timeout. This is the maximum amount of time allowed between an HSMS-level control message and its response. If the timer expires, communications failure is declared.	1 – 240 seconds	1 msec	5 seconds
T7	The T7 timeout is the NOT SELECTED timeout. This is the maximum amount of time a TCP/IP connection can remain in the NOT SELECTED state (no HSMS activity) before a communications failure is declared.	1 – 240 seconds	1 msec	10 seconds
T8	The T8 timeout is the network intercharacter timeout. This is the maximum amount of time allowed between successive bytes of a single	1 – 120 seconds	1 msec	5 seconds

	HSMS message before a communications failure is declared.			
linktest	The linktest timeout is the amount of time between successive transmissions HSMS LINKTEST.REQ messages. This is an HSMS level heartbeat that can be used to detect communications hardware failure such as a disconnected network cable.	1-240 seconds	1 msec	60 seconds
AUTOS9F1	This is an optional setting. Including AUTOS9F1 will cause an S9F1 Invalid Device-ID message to be transmitted whenever a message is received with a device ID that does not match the Device ID of the equipment.			AUTOS9F1
AUTOS9F9	Including AUTOS9F9 will cause S9F9 Transaction Timer Timeout messages to be sent whenever a T3 timer expires.			AUTOS9F9

8.1.2   SECS-I Configuration

Parameter	Description	Range	Resolution	Typical value
Serial Communication Hardware				
Device ID	The device-id identifies the equipment and will be assigned by the factory.	0 to 32767	1	32767
Comm Port	The com port is the RS232 port to use. CxSMS will support com port numbers higher than 9 such as COM10, COM11, etc.	COM1, COM2, etc		COM1
Baud Rate	The RS232 serial line speed to use.	300, 1200, 2400, 3600, 4800, 9600, 14400, 19200, 38400, 57600, 115200		9600
T1	The T1 timeout is the inter-character timeout. This is the maximum amount of time between characters in a message before a communications failure is declared.	0.1 – 10 seconds	1 msec	500
T2	The T2 timeout is the protocol timeout. This is the maximum amount of time between protocol level messages and replies before a communications failure is declared.	0.2 - 25.0 seconds	1 msec	10000
T3	The T3 timeout is the transaction timer. This is the maximum amount of time between a primary message and the expected response before declaring the transaction closed. If the timer expires, an S9F9 error message is sent if AUTOS9F9 is specified.	1 - 120 seconds	1 msec	45000
T4	The T4 timeout is the inter-block timeout and is the maximum amount of time allowed between successive blocks in a multi-block message before a communications failure is declared.	1 - 120 seconds	1 msec	45000

Retry	The retry number is the maximum number of times the equipment will attempt to send a message block before declaring a failed send.	0-31	1	3
Entity Role	The role of this entity (Always EQUIPMENT)	EQUIPMENT or HOST		EQUIPMENT
AUTOS9F1	This is an optional setting. Including AUTOS9F1 will cause an S9F1 Invalid Device-ID message to be transmitted whenever a message is received with a device ID that does not match the Device ID of the equipment.			AUTOS9F1
AUTOS9F9	Including AUTOS9F9 will cause S9F9 Transaction Timer Timeout messages to be sent whenever a T3 timer expires.			AUTOS9F9
Message Interleaving	Always interleaved.			

8.1.3   Multiple Host Configuration

This product can support multiple hosts and attention should be taken when configuring the communication setup. Each new connection will have a unique identification number.

ID	Name	Device ID
1	GEM Host 6000	32767

8.1.4   Host Connection Specific

Usually all GEM host interfaces are created using the identical setup. However, there are cases where host interfaces are unique.

You may want to restrict the functionality of some host interfaces. For example, you may want to allow only one host interface to perform process program management (recipe management). GEM features can be disabled for a host by configuring the connection-specific Well Known variables.

You also may want to provide features for one host interface that are not available to others. For example, you may want to create a host interface for your line controller and provide internal events and data that are not exposed to the manufacturer. You may create connection-specific variables, equipment constants, and collection events that are not available to other host interfaces.

8.2   Data Variables

ID	Name	Type	Unit	Min	Max	Description
0	AlarmID	U4	DV	U4 0	U4 4294967295	Alarm ID (ALID) of the most recent alarm to change state. This may be linked to any alarm's SET or CLEAR collection event.
1	EventLimit	L	DV	L	L	List of one or more Limit IDs of limits that have been crossed. This may be linked to any variable's Limit Monitoring collection event.

2	LimitVariable	U4	DV	U4 0	U4 4294967295	VID of variable associated with the last limit. This may be linked to any variable's Limit Monitoring collection event.
3	PPChangeName	A	DV	A	A	Name of the process program (recipe) created edited or deleted by the machine operator.
4	PPChangeStatus	U1	DV	U1 0	U1 255	Type of change made to a process program (recipe) by the machine operator. Possible values include 1 (created) 2 (edited) and 3 (deleted).
5	TransitionType	Bi	DV	Bi 0	Bi 255	Direction of a Limit Monitoring zone transition. This may be linked to any variable's Limit Monitoring collection event. Possible values include 0 (lower to upper) and 1 (upper to lower zone).
6	OperatorCommand	A	DV	A	A	The name of a command issued by the machine operator.
7	ECID	U4	DV	U4 0	U4 4294967295	The ID of the equipment constant changed by the machine operator.
8	HostECHostID	U4	DV	U4 0	U4 4294967295	ID of the host that changed the EC value. This may be linked to CE HostECChange. See also DV HostECID.
9	HostECID	U4	DV	U4 0	U4 4294967295	ECID changed by another host. This may be linked to CE HostECChange. See also DV HostECHostID.
10	HostCmdName	A	DV	A	A	Name of the remote command sent by another host.
11	HostCmdHostID	U4	DV	U4 0	U4 4294967295	ID of the host that sent a remote command.
12	HostPPChangeName	A	DV	A	A	Name of the process program (recipe) changed by another host. This may be linked to collection event HostPPChange. See also DV HostPPChangeStatus and HostPPChangeHostID.
13	HostPPChangeStatus	U1	DV	U1 0	U1 255	Type of change made to a process program (recipe) by another host. Possible values include 1 (created) 2 (edited) and 3 (deleted). This may be linked to collection event HostPPChange. See also DV HostPPChangeName and HostPPChangeHostID.
14	HostPPChangeHostID	U4	DV	U4 0	U4 4294967295	ID of the host that changed a process program (recipe).
2010	PPError	A	DV	A	A	A text data value with information about verification errors of a process program (recipe) that failed verification.

2052	ECChangeName	A	DV	A	A	The name of the equipment constant changed by the machine operator.
2053	ECChangeValue	Any	DV			The value of the equipment constant changed by the machine operator.
2055	CEDescription	A	DV	A	A	Description of the last collection event triggered.
2058	AlarmCode	Bi	DV	Bi 0	Bi 255	Alarm Code (ALCD) of the most recent alarm to change state. This may be linked to any alarm's SET or CLEAR collection event.
2059	AlarmText	A	DV	A	A	Alarm Text (ALTX) of the most recent alarm to change state. This may be linked to any alarm's SET or CLEAR collection event.
2060	ECPreviousValue	Any	DV			The value of the equipment constant before it was changed by the machine operator.
4027	LastCEID	U4	DV	U4 0	U4 4294967295	The last triggered CEID.
4029	DataID	U4	DV	U4 0	U4 4294967295	The last value of DATAID used in a SECS-II message.
60001	EventTime	A	DV	A	A 16	Event DataTime
60002	PCBResult	A	DV	A	A 10	Inspection result of pcb (GOOD/NG/PASS)
60003	PanelResult	A	DV	A	A 50000	Inspetion Result of each Array(Panel) 0 : Good/Pass 1 : NG B : BadMark (Scrap)
60004	PCBID	A	DV	A	A 255	Barcode Name
60005	PCBSide	A	DV	A	A 1	Inspection side of pcb (T or B)
60006	ProgramName	A	DV	A	A 255	Program recipe Name
60007	RAWDATA	A	DV	A	A 16M	Inspection Result NG data AOI : ArrayIndex, CRD, PackageName, InspectType, LeadID, Result\n…. SPI : PadID, PanelIndex, CompName, PadResult, Volume(%), Height(um), OffsetX(um), OffsetY(um), Area(%)\n….
61004	LaneID	A	DV	U1 0	U1 1	Current Lane ID of Event

8.3   *Status Variables*

ID	Name	Type	Unit	Min	Max	Description
15	LastPPRequested	A	SV	A	A	Name of the process program (recipe) requested by the equipment.

2004	Clock	A	SV			The value of the equipment's internal clock plus the offset from the ClockOffset variable. The format is determined by the equipment constant TimeFormat.
2008	MDLN	A	SV	A	A	Equipment model type up to 20 characters. The value is constant.
2009	PPExecName	L	SV	L	L	Currently selected process program (recipe). This process program (recipe) can not be deleted or overwritten by the host since it is considered to be in use. Frist ASCII is Lane1, Second ASCII is Lane2.
2015	SOFTREV	A	SV	A	A	Equipment software revision ID up to 20 characters. The value is constant.
2016	SpoolCountActual	U4	SV	U4 0	U4 4294967295	Number of messages actually stored in the spool area. Multi-block inquire/grant messages are not included in this count.
2017	SpoolCountTotal	U4	SV	U4 0	U4 4294967295	Total number of messages put into spool area from the time spooling was activated. Multi-block inquire/grant messages are not included in this count.
2018	SpoolFullTime	A	SV	A	A	Time when the spooling state machine area becomes full. The format is determined by the equipment constant TimeFormat.
2019	SpoolStartTime	A	SV	A	A	Time when the spooling state machine was last activated. The format is determined by the equipment constant TimeFormat.
2026	ALARMSENABLED	L	SV	L	L	List of all enabled ALID.
2027	ALARMSSET	L	SV	L	L	List of all currently SET ALIDs.
2028	CONTROLSTATE	U1	SV	U1 0	U1 5	State of the Control State Machine. Possible values include 1=EquipOffline 2=AttemptOnline 3=HostOffline 4=OnlineLocal and 5=OnlineRemote.
2029	EVENTSENABLED	L	SV	L	L	List of all enabled CEID.
2030	PREVIOUSPROCESSSTATE	U1	SV	U1 0	U1 255	Previous Processing State Machine state.
2031	PROCESSSTATE	U1	SV	U1 0	U1 255	Current Processing State Machine state.
2032	ProcessState	A	SV	A	A	Name of the current Processing State Machine state.
2033	ControlStateSwitch	U4	SV	U4 0	U4 1	The GEM local/remote control switch where 0 = local and 1 = remote.
2034	CtrlOnlineSwitch	U4	SV	U4 0	U4 1	The GEM online/offline control switch where 0 = offline and 1 = online.

2035	CommEnableSwitch	U4	SV	U4 0	U4 4294967295	The GEM communications enable/disable operator switch where 0 = disabled and 256 = enabled.
2036	CommState	U4	SV	U4 0	U4 4294967295	The current state of the GEM communications state machine where 0 = disabled 260 = communicating 273 = WaitCRA | WaitCRFromHost and 274 = WaitDelay | WaitCRFromHost.
2037	SpoolState	U4	SV	U4 0	U4 4294967295	The current state of the GEM spooling state machine where 0 = inactive 273 = NoSpoolOutput | SpoolNotFull 274 = TransmitSpool | SpoolNotFull 276 = PurgeSpool | SpoolNotFull 289 = NoSpoolOutput | SpoolFull 290 = TransmitSpool | SpoolFull 292 = PurgeSpool | SpoolFull.
2050	ASer	U4	SV	U4 0	U4 4294967295	The alarm state change count since startup.
2051	Time	A	SV			Equipment computer date and time. The format is determined by the equipment constant TimeFormat.
2054	AlarmState	U1	SV	U1 0	U1 255	State of the alarm that last changed state since startup(128=SET 0=CLEAR null=no alarm state change).
2056	PPFormat	U1	SV	U1 1	U1 16	Indicates the type or types of process programs and recipes that are supported
4030	PreviousControlState	U1	SV	U1 0	U1 255	The previous state of the Control State Machine. Values include 1=EquipOffline 2=AttemptOnline 3=HostOffline 4=OnlineLocal and 5=OnlineRemote.
61001	UserID	A	SV	A	A	Current login User ID
61002	LotID	L	SV	L	L	Current Lot ID of each lane. Frist ASCII is Lane1, Second ASCII is Lane2.

8.4   Equipment Constants

ID	Name	Type	Unit	Min	Max	Default	Description
4000	EstablishCommunicationsTimeout	U2	EC	U2 0	U2 65535	U2 10	Communication attempt timeout. When the Communication State Machine is enabled but not communicating the machine will attempt to establish communication with a host every timeout period.

4005	MaxSpoolTransmit	U4	EC	U4 0	U4 4294967295	U4 10	Maximum number of messages that the machine will transmit from the spool area in response to an S6F23 (transmit spooled messages) request as part of the Spooling State Machine. If 0 there is no limit. Multi-block inquire/grant messages are not included in this count.
4009	OverwriteSpool	Bo	EC	Bo 0	Bo 1	Bo 0	Determines whether to overwrite data in the spool area or to discard further messages when the spool area is full as part of the Spooling State Machine. Possible values include 1 (overwrite) and 0 (discard).
4010	SpoolEnabled	Bo	EC	Bo 0	Bo 1	Bo 0	Enable or disable the Spooling State Machine. Disabling the Spooling State Machine will not make it INACTIVE if already ACTIVE. Possible values include 1 (enabled) and 0 (disabled).
4011	WBitS10	Bo	EC	Bo 0	Bo 1	Bo 1	Request host reply for stream 10 messages (Terminal Services). Possible values include 1 (reply) 0 (no reply).
4012	WBitS5	Bo	EC	Bo 0	Bo 1	Bo 1	Request host reply for stream 5 messages (Alarms). Possible values include 1 (reply) 0 (no reply).
4013	WBitS6	Bo	EC	Bo 0	Bo 1	Bo 1	Request host reply for stream 6 messages (Events). If the machine is producing frequent collection events it may be a good idea to disable request reply. Possible values include 1 (reply) 0 (no reply).
4020	TimeFormat	U4	EC	U4 0	U4 2	U4 1	Time format selection. Possible values include 1 (compliant 16 byte); 0 (not compliant 12 byte) and 2 (Extended YYYY-MM-DDThh:mm:ss.sTZD). Depends on ExtendedTimeFormat when set to 2.
4021	DefCtrlOfflineState	U1	EC	U1 1	U1 3	U1 3	State of the Control State Machine when going offline. Possible values include 1 = Equipment Offline 3 = Host Offline.
4022	EventReportMsg	U4	EC	U4 0	U4 4294967295	U4 67083	Specifies the event report message. Possible values include 67083 (S6F11) 67075 (S6F3) 67085 (S6F13).
4023	DefaultCommState	U4	EC	U4 0	U4 256	U4 256	The default state of the GEM communications state machine where 0 = disabled and 256 = enabled.
4024	DefaultCtrlState	U1	EC	U1 0	U1 5	U1 0	The default state of the GEM control state machine: 0=Online where ControlStateSwitch determines the sub-state; 1=EquipOffline; 2=AttemptOnline; 3=HostOffline; 4=OnlineLocal; 5=OnlineRemote.

4025	HeartBeat	U2	EC	U2 0	U2 65535	U2 0	The frequency (in seconds) at which S1F1 messages are sent to the host (0 turns it off).
4031	S6MultiBlockInquire	Bo	EC	Bo 0	Bo 1	Bo 0	Enable or disable the usage of S6F5 multi-block inquire (MBI) messages. 1=send MBI 0=don't send MBI.
4032	SpoolingWaitDelayActivation	U1	EC	U1 0	U1 2	U1 0	0=Spooling is not activated when the WAIT CRA to WAIT DELAY communication state machine transition occurs; 1=Spooling is activated anytime the WAIT CRA to WAIT DELAY communication state machine transition occurs and spooling is enabled (this establishes strict compliance with E30); 2=Spooling is activated after the second WAIT CRA to WAIT DELAY communication state machine trasition (this allows the host time to establish communication without aggressively activating spooling).
4036	ExtendedTimeFormat	U1	EC	U1 0	U1 1	U1 0	The format applied to report time values when TimeFormat EC is 2. 0=UTC (default setting; PV2 compliant); 1=local time with time zone offset.
301005	VariableReportingStyle	U4	EC	U4 0	U4 4294967295	U4 0	S1F3 and S2F23 VID tolerance where 0 = Strict compliance with SEMI standards where only SVID are allowed; 1 = Allow any variable type (SV; DV; or EC) to be reported.
301008	TraceReportMultiBlock	U4	EC	U4 0	U4 4294967295	U4 1	Allow Trace Reports with total data size that is larger than 244 bytes (0 = do not allow large reports. 1[default] = allow large trace reports). It is recommended to leave this at U4 1. Set to 0 to help avoid unintentional performance degradation from trace reports larger than 244 bytes.
301010	SpoolingActivatedEventOption1	U1	EC	U1 0	U1 255	U1 1	Options for sending SpoolingActivated GEM Collection Event (0=trigger event when the Spooling state changes to ACTIVE; 1=trigger event before any queued messages have been spooled).
301013	SupportPV2	U1	EC	U1 0	U1 255	U1 0	0 = default behavior - GEM functionality; 1 = enable PV2 behavior. Causes CIMConnect not to send Event reports for Set/Clear Alarm events if the Alarm is not enabled.

| 301017 | S2F35DisablesEvents | U1 | EC | U1 0 | U1 255 | U1 1 | When this variable exists and is set to non-zero value the equipment will automatically disable the collection event whenever a link to a report is created by S2F35 message from GEM Host or deleted by S2F35 or S2F33 message. A zero value is not GEM compliant. |

8.5 *Alarms*

Machine Type : SPI

ID	Name	Set CE	Clear CE	Text
2	2	10000002	20000002	Fiducial Error
6	6	10000006	20000006	Defect pad on this PCB!
7	7	10000007	20000007	Entry Converyor Loading failed!
8	8	10000008	20000008	Work Converyor Loading failed!
9	9	10000009	20000009	Exit Converyor Loading failed!
12	12	10000012	20000012	PCB Loading/Unloading failed!
13	13	10000013	20000013	Manual Motion failed!
14	14	10000014	20000014	Air Pressure Level is too low!
17	17	10000017	20000017	Failed to adjust Entry Converyor Width!
18	18	10000018	20000018	Failed to adjust Work Converyor Width!
19	19	10000019	20000019	Failed to adjust Exit Converyor Width!
20	20	10000020	20000020	Error not defined.
21	21	10000021	20000021	Failed to find the Fiducials!
22	22	10000022	20000022	PCB has too much Rotation.
23	23	10000023	20000023	Failed to find the Fiducials after job changing!
27	27	10000027	20000027	Control Power is off.
31	31	10000031	20000031	DB Result Write Error
32	32	10000032	20000032	Barcode recognize failure
34	34	10000034	20000034	Camera Captur Error
35	35	10000035	20000035	Return messages not received from the MES
36	36	10000036	20000036	Receive NG Return from the MES
37	37	10000037	20000037	Barcode recognize failure
38	38	10000038	20000038	Configurable Stop
39	39	10000039	20000039	Result DB Write TimeOut
40	40	10000040	20000040	Result week DB creation Error
50	50	10000050	20000050	DS Connection failure

51	51	10000051	20000051	When using the DS hard space
52	52	10000052	20000052	DS Connection failure
53	53	10000053	20000053	Out of Memory Error
54	54	10000054	20000054	DS case definition used for the completion of Error
55	55	10000055	20000055	KYMessanger connection failure
56	56	10000056	20000056	Coverage Report File Write Error
60	60	10000060	20000060	Vision Processing barcode processing Error
900	900	10000900	20000900	There is a PCB in the Multi Rack!
901	901	10000901	20000901	NG Rack is full of PCBs!
902	902	10000902	20000902	There is a PCB in NG Rack!
903	903	10000903	20000903	Not registered BBT-Vendor name!
904	904	10000904	20000904	No Multi-Vendor Teaching (position) value!
905	905	10000905	20000905	No BBT information registered!
906	906	10000906	20000906	There are some problems about PZT Movement.
907	907	10000907	20000907	The gray Level of left image's brightness is less 10.
908	908	10000908	20000908	The gray Level of right image's brightness is less 10.
909	909	10000909	20000909	A software error such as memory allocation is occured during the inspecting
910	910	10000910	20000910	Fiducial Inspection Error
911	911	10000911	20000911	MEMORY ALLOCATION Error
912	912	10000912	20000912	Inspection Result Reading Error
999	999	10000999	20000999	There are PCBs in Multi Rack!
1000	1000	10001000	20001000	PCB failed to arrive at ENTRY IN sensor!
1001	1001	10001001	20001001	PCB failed to pass ENTRY IN sensor!
1002	1002	10001002	20001002	PCB failed to arrive at ENTRY OUT sensor!
1003	1003	10001003	20001003	PCB failed to pass ENTRY OUT sensor!
1004	1004	10001004	20001004	Work IN sensor failed to detect PCB!
1005	1005	10001005	20001005	PCB failed to arrive at WORK SLOW sensor!
1006	1006	10001006	20001006	PCB failed to arrive at WORK OUT sensor!
1007	1007	10001007	20001007	PCB failed to pass WORK OUT sensor!
1008	1008	10001008	20001008	WORK IN/OUT sensors detected PCB at the same time!
1009	1009	10001009	20001009	EXIT IN sensor failed to detect PCB!
1010	1010	10001010	20001010	PCB failed to pass EXIT IN sensor!
1011	1011	10001011	20001011	PCB failed to arrive at EXIT OUT sensor!
1012	1012	10001012	20001012	PCB failed to pass EXIT OUT sensor!
1013	1013	10001013	20001013	Stencil needs to be replaced!
1014	1014	10001014	20001014	PCB did not arrive at FRONT ENTRY IN sensor.
1015	1015	10001015	20001015	PCB is jammed at FRONT ENTRY IN sensor.

1016	1016	10001016	20001016	PCB did not arrive at FRONT WORK OUT sensor.
1017	1017	10001017	20001017	PCB is jammed at FRONT WORK OUT sensor.
1018	1018	10001018	20001018	PCB did not arrive at FRONT EXIT OUT sensor.
1019	1019	10001019	20001019	PCB is jammed at FRONT EXIT OUT sensor.
1020	1020	10001020	20001020	PCB did not arrive at REAR ENTRY IN sensor.
1021	1021	10001021	20001021	PCB is jammed at WORK IN sensor.
1022	1022	10001022	20001022	There is a problem in UpStream SMEMA In.
1023	1023	10001023	20001023	There is a problem with Upstream SMEMA Out.
1024	1024	10001024	20001024	There is a problem with DownStream SMEMA In.
1025	1025	10001025	20001025	There is a problem with DownStream SMEMA Out.
1026	1026	10001026	20001026	All of Rail Up and Down Sensor is detected.
1028	1028	10001028	20001028	None of Rail Up and Down Sensor is detected.
1029	1029	10001029	20001029	Twist Rail Up/Donw Sensor Cable.
1031	1031	10001031	20001031	FRONT ENTRY RAIL UP SENSOR not checked.
1032	1032	10001032	20001032	FRONT ENTRY RAIL DOWN SENSOR not checked.
1033	1033	10001033	20001033	FRONT WORK RAIL UP SENSOR not checked.
1034	1034	10001034	20001034	FRONT WORK RAIL DOWN SENSOR not checked.
1035	1035	10001035	20001035	FRONT EXIT RAIL UP SENSOR not checked.
1036	1036	10001036	20001036	FRONT EXIT RAIL DOWN SENSOR not checked.
1037	1037	10001037	20001037	FRONT RACK1 CYLINDER UP SENSOR not checked.
1038	1038	10001038	20001038	FRONT RACK1 CYLINDER UP SENSOR not released
1039	1039	10001039	20001039	FRONT RACK2 CYLINDER UP Sensors not checked.
1040	1040	10001040	20001040	FRONT RACK1 CYLINDER UP SENSOR not released
1041	1041	10001041	20001041	REAR ENTRY RAIL UP SENSOR not checked.
1042	1042	10001042	20001042	REAR ENTRY RAIL DOWN SENSOR not checked.
1043	1043	10001043	20001043	REAR WORK RAIL UP SENSOR not checked.
1044	1044	10001044	20001044	REAR WORK RAIL DOWN SENSOR not checked.
1045	1045	10001045	20001045	REAR EXIT RAIL UP SENSOR not checked.
1046	1046	10001046	20001046	REAR EXIT RAIL DOWN SENSOR not checked.
1050	1050	10001050	20001050	PCB is jammed at REAR ENTRY IN sensor.
1051	1051	10001051	20001051	PCB did not arrive at REAR WORK OUT sensor.
1052	1052	10001052	20001052	PCB is jammed at REAR WORK OUT sensor.
1053	1053	10001053	20001053	PCB did not arrive at REART EXIT OUT sensor.
1054	1054	10001054	20001054	PCB is jammed at REAR EXIT OUT sensor.
1055	1055	10001055	20001055	There has some problem during PCB moving.
1056	1056	10001056	20001056	Conveyor Error Cleared.
1057	1057	10001057	20001057	REAR RACK1 CYLINDER UP SENSOR not checked.
1058	1058	10001058	20001058	REAR RACK1 CYLINDER UP SENSOR not released.

1059	1059	10001059	20001059	REAR RACK2 CYLINDER UP SENSOR not checked.
1060	1060	10001060	20001060	REAR RACK2 CYLINDER UP SENSOR not released.
1088	1088	10001088	20001088	There is a PCB between conveyors!
1089	1089	10001089	20001089	There is no PCB on Work Converyor!
1091	1091	10001091	20001091	Bad Marking Cylinder shows false movements!
1093	1093	10001093	20001093	PCB detected on conveyors!
1100	1100	10001100	20001100	PCB failed to arrive at MR EXIT CHECK sensor!
1101	1101	10001101	20001101	PCB failed to arrive at MR EXIT IN sensor!
1102	1102	10001102	20001102	PCB failed to pass MR EXIT IN sensor!
1103	1103	10001103	20001103	PCB failed to arrive at MR EXIT OUT sensor!
1104	1104	10001104	20001104	PCB failed to pass MR EXIT IN sensor!
1105	1105	10001105	20001105	NG_PCB does not exist in MODE
1106	1106	10001106	20001106	PCB is located at wrong position in Multi Rack
1107	1107	10001107	20001107	GOOD_PCB did not become compulsorily the discharge in MODE
1108	1108	10001108	20001108	WORK IN/OUT sensors detected PCB at the same time!
1109	1109	10001109	20001109	PCB check sensor at Exit Conveyor detected wrong object!
1111	1111	10001111	20001111	MR EXIT STOPPER Cyliner shows wrong movement!
1112	1112	10001112	20001112	MR EXIT IN Cylinder Off sensor failed to work!
1113	1113	10001113	20001113	MR EXIT IN Cylinder On sensor failed to work!
1114	1114	10001114	20001114	MR EXIT OUT Cylinder Off sensor failed to work!
1115	1115	10001115	20001115	MR EXIT OUT Cylinder On sensor failed to work!
1117	1117	10001117	20001117	There is no NG PCB in NG Rack!
1119	1119	10001119	20001119	Multi Rack is opened!
1121	1121	10001121	20001121	MR EXIT IN Sensor detected a PCB!
1123	1123	10001123	20001123	MR PCB IN Sensor detected a PCB!
1125	1125	10001125	20001125	MR EXIT BELT END Sensor detected a PCB!
1127	1127	10001127	20001127	MR EXIT OUT Sensor detected a PCB!
1129	1129	10001129	20001129	MR Z axis shows false movements!
1130	1130	10001130	20001130	There are some problems during Conveyor Width adjustment.
1132	1132	10001132	20001132	Machine does not have conveyor width home position!
1133	1133	10001133	20001133	Machine had emergency status during conveyor width adjustment.
1135	1135	10001135	20001135	Fiducial inspection error
1141	1141	10001141	20001141	PCB failed to pass FRONT RACK1 BUFFER IN sensor.
1142	1142	10001142	20001142	PCB did not arrive at FRONT RACK1 BUFFER OUT sensor.
1143	1143	10001143	20001143	PCB failed to pass FRONT RACK1 BUFFER OUT sensor.
1144	1144	10001144	20001144	Unknown PCB is detected in FRONT RACK1 BUFFER sensor.
1145	1145	10001145	20001145	Unknown PCB is detected in FRONT RACK2 BUFFER sensor.
1146	1146	10001146	20001146	PCB is removed in FRONT RACK1 BUFFER sensor.

1147	1147	10001147	20001147	PCB is removed in FRONT RACK2 BUFFER sensor.
1148	1148	10001148	20001148	FRONT RACK is full by NG PCB.
1151	1151	10001151	20001151	PCB failed to pass REAR RACK1 BUFFER IN sensor.
1152	1152	10001152	20001152	PCB did not arrive at REAR RACK1 BUFFER OUT sensor.
1153	1153	10001153	20001153	PCB failed to pass REAR RACK1 BUFFER OUT sensor.
1154	1154	10001154	20001154	Unknown PCB is detected in REAR RACK1 BUFFER sensor.
1155	1155	10001155	20001155	Unknown PCB is detected in REAR RACK2 BUFFER sensor.
1156	1156	10001156	20001156	PCB is removed in REAR RACK1 BUFFER sensor.
1157	1157	10001157	20001157	PCB is removed in REAR RACK2 BUFFER sensor.
1158	1158	10001158	20001158	REAR RACK is full by NG PCB.
1161	1161	10001161	20001161	PCB did not arrive at FRONT ENTRY IN sensor.
1162	1162	10001162	20001162	PCB is jammed at FRONT ENTRY IN sensor.
1163	1163	10001163	20001163	PCB did not arrive at FRONT ENTRY OUT sensor.
1164	1164	10001164	20001164	PCB is jammed at FRONT ENTRY OUT sensor.
1165	1165	10001165	20001165	PCB did not arrive at FRONT WORK IN sensor.
1166	1166	10001166	20001166	PCB is jammed at FRONT WORK IN sensor.
1167	1167	10001167	20001167	PCB did not arrive at FRONT WORK OUT sensor.
1168	1168	10001168	20001168	PCB is jammed at FRONT WORK OUT sensor.
1169	1169	10001169	20001169	PCB did not arrive at FRONT EXIT IN sensor.
1170	1170	10001170	20001170	PCB is jammed at FRONT EXIT IN sensor.
1171	1171	10001171	20001171	PCB did not arrive at FRONT EXIT OUT sensor.
1172	1172	10001172	20001172	PCB is jammed at FRONT EXIT OUT sensor.
1173	1173	10001173	20001173	There are two PCB on FRONT Conveyor.
1178	1178	10001178	20001178	There are PCB that for a long time waiting to FRONT CONVEYOR.
1181	1181	10001181	20001181	PCB did not arrive at REAR ENTRY IN sensor.
1182	1182	10001182	20001182	PCB is jammed at REAR ENTRY IN sensor.
1183	1183	10001183	20001183	PCB did not arrive at REAR ENTRY OUT sensor.
1184	1184	10001184	20001184	PCB is jammed at REAR ENTRY OUT sensor.
1185	1185	10001185	20001185	PCB did not arrive at REAR WORK IN sensor.
1186	1186	10001186	20001186	PCB is jammed at REAR WORK IN sensor.
1187	1187	10001187	20001187	PCB did not arrive at REAR WORK OUT sensor.
1188	1188	10001188	20001188	PCB is jammed at REAR WORK OUT sensor.
1189	1189	10001189	20001189	PCB did not arrive at REAR EXIT IN sensor.
1190	1190	10001190	20001190	PCB is jammed at REAR EXIT IN sensor.
1191	1191	10001191	20001191	PCB did not arrive at REAR EXIT OUT sensor.
1192	1192	10001192	20001192	PCB is jammed at REAR EXIT OUT sensor.
1193	1193	10001193	20001193	There are two PCB on REAR Conveyor.

1194	1194	10001194	20001194	FRONT Work Stopper Up Sensor was not perceived.
1195	1195	10001195	20001195	FRONT Work Stopper Down Sensor was not perceived.
1196	1196	10001196	20001196	REAR Work Stopper Up Sensor was not perceived.
1197	1197	10001197	20001197	REAR Work Stopper Down Sensor was not perceived.
1198	1198	10001198	20001198	There are PCB that for a long time waiting to REAR CONVEYOR.
1200	1200	10001200	20001200	WFTPD.exe is not running!
1201	1201	10001201	20001201	EMERGENCY button pressed or Front Door is open!
1202	1202	10001202	20001202	Low air pressure!
1203	1203	10001203	20001203	Motion Control PC(RTPC) shows false movements!
1204	1204	10001204	20001204	Front door is opened!
1205	1205	10001205	20001205	Motion Board Initialization failed so WinMCS Program is going to shut down.
1206	1206	10001206	20001206	IO Board Initialization is failed so WinMCS Program is going to shut down.
1207	1207	10001207	20001207	Serial communication error with STMC.
1208	1208	10001208	20001208	Front Door is opened.
1209	1209	10001209	20001209	Rear Door is opened.
1210	1210	10001210	20001210	There is a Communication Error with STMC Board.
1211	1211	10001211	20001211	Servo not Ready State.
1212	1212	10001212	20001212	The Contorl Power is OFF.
1213	1213	10001213	20001213	The Contorl Power is OFF.
1214	1214	10001214	20001214	The Contorl Power is OFF.
1215	1215	10001215	20001215	Dust detected in PCB.
1216	1216	10001216	20001216	High air pressure.
1220	1220	10001220	20001220	Fiducial Result Error
1700	1700	10001700	20001700	PZT AMP detected false signal!
1800	1800	10001800	20001800	CamBarcode Time Out Error
1801	1801	10001801	20001801	BadMarker Time Out Error
1802	1802	10001802	20001802	MultiVender Time Out Error
2000	2000	10002000	20002000	Servo Not Ready!
2001	2001	10002001	20002001	X Axis Limit Error!
2002	2002	10002002	20002002	Y Axis Limit Error!
2003	2003	10002003	20002003	Z Axis Limit Error!
2004	2004	10002004	20002004	X Axis Position Error!
2005	2005	10002005	20002005	Y Axis Position Error!
2006	2006	10002006	20002006	Z Axis Position Error!
2007	2007	10002007	20002007	M Axis Position Error!
2008	2008	10002008	20002008	M Axis Limit Error!
2009	2009	10002009	20002009	U Axis Position Error!

2010	2010	10002010	20002010	V Axis Position Error!
2011	2011	10002011	20002011	Failed to read SST file!
2013	2013	10002013	20002013	Failed to read Job file!
2014	2014	10002014	20002014	Fail to read LampUserSet file.
2016	2016	10002016	20002016	Axis moving command is exceed hardware Positive limit
2017	2017	10002017	20002017	Axis moving commandhas exceeded hardware Negative limit
2019	2019	10002019	20002019	U Axis Motor AMP is not READY.
2020	2020	10002020	20002020	V Axis Motor AMP is not READY.
2021	2021	10002021	20002021	X Axis Motor AMP is not READY.
2022	2022	10002022	20002022	Y Axis Motor AMP is not READY.
2023	2023	10002023	20002023	Z Axis Motor AMP is not READY.
2024	2024	10002024	20002024	M Axis Motor AMP is not READY.
2025	2025	10002025	20002025	X Axis Motor AMP is not Servo On.
2026	2026	10002026	20002026	Y Axis Motor AMP is not Servo On
2027	2027	10002027	20002027	Z Axis Motor AMP is not Servo On
2028	2028	10002028	20002028	U Axis Motor AMP is not Servo On
2029	2029	10002029	20002029	V Axis Motor AMP is not Servo On
2031	2031	10002031	20002031	X axis checked (-)limit sensor.
2032	2032	10002032	20002032	Y axis checked (-)limit sensor.
2033	2033	10002033	20002033	Z axis checked (-)limit sensor.
2034	2034	10002034	20002034	M axis checked (-)limit sensor.
2036	2036	10002036	20002036	X axis checked (+)limit sensor.
2037	2037	10002037	20002037	Y axis checked (+)limit sensor.
2038	2038	10002038	20002038	Z axis checked (+)limit sensor.
2039	2039	10002039	20002039	M axis checked (+)limit sensor.
2041	2041	10002041	20002041	Emergency status happened during homing.
2042	2042	10002042	20002042	Job file command position is above Motion Stroke Length.
2045	2045	10002045	20002045	Did not remove PCB of Inside NG_Buffer
2046	2046	10002046	20002046	Did not remove PCB of inside NG_Buffer
2047	2047	10002047	20002047	Motion dose not move to the Inspection Position
2048	2048	10002048	20002048	U Axis Position Error.
2049	2049	10002049	20002049	Y Axis Position Error.
2050	2050	10002050	20002050	U axis checked (-)limit sensor.
2051	2051	10002051	20002051	Y axis checked (-)limit sensor.
2052	2052	10002052	20002052	U axis checked (+)limit sensor..
2053	2053	10002053	20002053	Y axis checked (+)limit sensor.
2080	2080	10002080	20002080	Communication Error
2101	2101	10002101	20002101	Head motor and Lens motor shows different transfer value!

2102	2102	10002102	20002102	Lens motor and Head motor shows different transfer value!
2201	2201	10002201	20002201	Conveyors are still moving.
2203	2203	10002203	20002203	Machine does not Move.
2204	2204	10002204	20002204	Machine Basic Setting is Changed.
2300	2300	10002300	20002300	Head StepServo Motor Amp is not in Servo On status.
2301	2301	10002301	20002301	Head StepServo Motor Postive Limit Error.
2302	2302	10002302	20002302	Lens StepServo Motor Amp is not Servo On.
2303	2303	10002303	20002303	Lens StepServo Motor Postive Limit Error.
2304	2304	10002304	20002304	StepZoom Motor Moving Time Out.
2305	2305	10002305	20002305	StepZoom Motor Following Error.
2306	2306	10002306	20002306	Head Motor Communication Error.
2307	2307	10002307	20002307	Lens Motor Communication Error.
2308	2308	10002308	20002308	Head StepServo Received Error.
2309	2309	10002309	20002309	Lens StepServo Received Error.
2310	2310	10002310	20002310	Conveyor Width Setting Value Error.
2311	2311	10002311	20002311	Conveyor Command Value is Under the Minimum Value.
2312	2312	10002312	20002312	Conveyor Command Value is Over the Maximum Value.
2410	2410	10002410	20002410	Front Lane UpStream SMEMA In Error.
2411	2411	10002411	20002411	Rear Lane UpStream SMEMA In Error.
2412	2412	10002412	20002412	Front Lane DownStream SMEMA In Error.
2413	2413	10002413	20002413	Rear Lane DownStream SMEMA In Error.
2415	2415	10002415	20002415	Conveyor Rail 1 & 2 Collision Error.
2416	2416	10002416	20002416	Conveyor Rail 2 & 3 Collision Error.
2417	2417	10002417	20002417	Conveyor Rail 3 & 4 Collision1 Error.
2418	2418	10002418	20002418	Conveyor Rail 3 & 4 Collision2 Error.
2419	2419	10002419	20002419	Conveyor Backup Unit Collision Error.
2420	2420	10002420	20002420	Rail1 Command is Collision Position against Rail2.
2421	2421	10002421	20002421	Rail2 Command is Collision Position against Rail1.
2422	2422	10002422	20002422	Rail2 Command is Collision Position against Rail3.
2423	2423	10002423	20002423	Rail3 Command is Collision Position against Rail2.
2424	2424	10002424	20002424	Rail3 Command is Collision Position against Rail4.
2425	2425	10002425	20002425	Rail4 Command is Collision Position against Rail3.
2430	2430	10002430	20002430	NG-PCB was not removed.
2431	2431	10002431	20002431	Checked Front Lane PCB Collision Sensor.
2432	2432	10002432	20002432	Checked Rear Lane PCB Collision Sensor.
2433	2433	10002433	20002433	Please Check GUI Error Message
2434	2434	10002434	20002434	Backup Pin Unit Setting is Changed.
2435	2435	10002435	20002435	Before Conveyor Width adjustment

2436	2436	10002436	20002436	Conveyor Width adjustment done
2437	2437	10002437	20002437	Checked Front Lane PCB Collision Sensor.
2438	2438	10002438	20002438	Checked Front Lane PCB Work Out Collision Sensor.
2440	2440	10002440	20002440	The laser for Auto focus fails to find a focus height.
2441	2441	10002441	20002441	MCS did not get PCB Defect Result of Lane1.
2442	2442	10002442	20002442	MCS did not get PCB Defect Result of Lane2.
2443	2443	10002443	20002443	MCS did not read Job file.
2500	2500	10002500	20002500	There are some Communication Error of Laser System.
2600	2600	10002600	20002600	Motion Gain Value Error.
2601	2601	10002601	20002601	Axis Encoder Error.
2602	2602	10002602	20002602	Motion Following Error.
2603	2603	10002603	20002603	Checked Hardware Conveyor Manual Switch On.
2604	2604	10002604	20002604	There some Problem on Initializing STMC Board.
2605	2605	10002605	20002605	It needs enough review and aging test.
2606	2606	10002606	20002606	X_AXIS Motion Following
2607	2607	10002607	20002607	Y_AXIS Motion Following Error.
2608	2608	10002608	20002608	Entry Shuttle Motion Following Error.
2609	2609	10002609	20002609	Exit Shuttle Motion Following Error.
2610	2610	10002610	20002610	Dispenser Z-Axis Motion Following Error.
2611	2611	10002611	20002611	Checked Rail 1 Up Sensor.
2612	2612	10002612	20002612	It does not Check Rail 1 Up Sensor.
2613	2613	10002613	20002613	Checked Rail 2 Up Sensor.
2614	2614	10002614	20002614	It does not Check Rail 2 Up Sensor.
2615	2615	10002615	20002615	Checked Rail 1/2 Up Sensor.
2616	2616	10002616	20002616	It does not Check 1/2 Up Sensor.
2618	2618	10002618	20002618	Motion Done TimeOut Error
2620	2620	10002620	20002620	Checked Front Side Pusher Up Sensor.
2621	2621	10002621	20002621	Checked Front Side Pusher Down Sensor.
2622	2622	10002622	20002622	Checked Rear Side Pusher Up Sensor.
2623	2623	10002623	20002623	Checked Rear Side Pusher Down Sensor.
2650	2650	10002650	20002650	Long BarCodeTeaching Error
2651	2651	10002651	20002651	Max Warpage Limit Error
2652	2652	10002652	20002652	Board Inspection TimeOut Error
2653	2653	10002653	20002653	Max Shrinkage Limit Error
2661	2661	10002661	20002661	Conveyor Rail1 Checked Home Sensor.
2662	2662	10002662	20002662	Conveyor Rail2 Checked Home Sensor.
2663	2663	10002663	20002663	Conveyor Rail3 Checked Home Sensor.
2664	2664	10002664	20002664	Conveyor Rail4 Checked Home Sensor.

2665	2665	10002665	20002665	Change Downstream Conveyor adjust timeout error.
2666	2666	10002666	20002666	It is Upstream EMG.
2667	2667	10002667	20002667	It is Downstream EMG.
2668	2668	10002668	20002668	PCB did not arrive at Work OUT sensor from Entry.
2669	2669	10002669	20002669	Current conveyor width is same as set PCB width.
2670	2670	10002670	20002670	PCB verification result time out error.
2671	2671	10002671	20002671	Door Lock error
2672	2672	10002672	20002672	Entry Conv Width Limit error
2673	2673	10002673	20002673	Work Conv Width Limit error
2674	2674	10002674	20002674	Exit Conv Width Limit error
2675	2675	10002675	20002675	There is not inspected PCB.
2676	2676	10002676	20002676	Inspection result is NG.
2677	2677	10002677	20002677	Vacuum pressure sensor is not detected.
2678	2678	10002678	20002678	Vacuum pressure sensor is not turned off.
2679	2679	10002679	20002679	Lane1 P Machine Info Ack Timeout Error
2680	2680	10002680	20002680	Lane2 P Machine Info Ack Timeout Error
2681	2681	10002681	20002681	Barcode Shuttle Limit Sensor Error.
2682	2682	10002682	20002682	Barcode Shuttle located Home.
2683	2683	10002683	20002683	Barcode Shuttle does not operate normally.
2684	2684	10002684	20002684	Barcode Shuttle command exceeds the maximum value set.
2685	2685	10002685	20002685	Barcode Shuttle command less the minimum value set.
2686	2686	10002686	20002686	Dispenser Purge error.
2687	2687	10002687	20002687	Dispenser Syringe air pressure limit error.
2701	2701	10002701	20002701	The Back-up Plate Clamp is open
2711	2711	10002711	20002711	Lane1 Height Guide Sensor Error
2712	2712	10002712	20002712	Lane2 Height Guide Sensor Error
2713	2713	10002713	20002713	Conveyor Home Move exceeded the time.
2714	2714	10002714	20002714	Flipper Home Move exceeded the time.
2715	2715	10002715	20002715	Flipper Move exceeded the time.
2716	2716	10002716	20002716	Failed to Move. (Home)
2717	2717	10002717	20002717	Failed to Move.
2800	2800	10002800	20002800	Command sync error
2801	2801	10002801	20002801	Fail to renewal origin of machine
2802	2802	10002802	20002802	Tried to turn servo on while Alarming
2803	2803	10002803	20002803	Tried to turn servo on while Emergency mode
2804	2804	10002804	20002804	Please press OK after releasing bolt of backup pin unit
2810	2810	10002810	20002810	Lane1 entry plate up/down cylinder shows false movements!
2811	2811	10002811	20002811	Lane1 entry turn cylinder shows false movements!

2812	2812	10002812	20002812	Lane1 flip stage elevator Axis shows false movements! (Homming)
2813	2813	10002813	20002813	Lane1 flip stage elevator Axis shows false movements! (Moving)
2814	2814	10002814	20002814	Lane1 flip stage bridge cylinder shows false movements!
2815	2815	10002815	20002815	Lane1 flip stage gear cylinder shows false movements!
2816	2816	10002816	20002816	Unknown PCB is detected in lane1.
2817	2817	10002817	20002817	Lane2 entry plate up/down cylinder shows false movements!
2818	2818	10002818	20002818	Lane2 entry turn cylinder shows false movements!
2819	2819	10002819	20002819	Lane2 flip stage elevator Axis shows false movements! (Homming)
2820	2820	10002820	20002820	Lane2 flip stage elevator Axis shows false movements! (Moving)
2821	2821	10002821	20002821	Lane2 flip stage bridge cylinder shows false movements!
2822	2822	10002822	20002822	Lane2 flip stage gear cylinder shows false movements!
2823	2823	10002823	20002823	Unknown PCB is detected in lane2.
2824	2824	10002824	20002824	Flip stage elevator Axis shows false movements!
2825	2825	10002825	20002825	Conveyor sensor detected.
2826	2826	10002826	20002826	L1_FLIPPER Axis S/W (-)limit error!
2827	2827	10002827	20002827	L1_FLIPPER Axis S/W (+)limit error!
2828	2828	10002828	20002828	L1_FLIPPER Axis motion Parameter (-)Limit error!
2829	2829	10002829	20002829	L1_FLIPPER Axis motion Parameter (+)Limit error!
2830	2830	10002830	20002830	L1_FLIPPER Axis position overflow error!
2831	2831	10002831	20002831	L1_FLIPPER Axis over current error!
2832	2832	10002832	20002832	L1_FLIPPER Axis over speed error!
2833	2833	10002833	20002833	L1_FLIPPER Axis position tracking error!
2834	2834	10002834	20002834	L1_FLIPPER Axis over load error!
2835	2835	10002835	20002835	L1_FLIPPER Axis over heat error!
2836	2836	10002836	20002836	L1_FLIPPER Axis back EMF error!
2837	2837	10002837	20002837	L1_FLIPPER Axis motor power error!
2838	2838	10002838	20002838	L1_FLIPPER Axis inposition error!
2839	2839	10002839	20002839	L1_FLIPPER Axis EMG status!
2840	2840	10002840	20002840	L1_FLIPPER Axis step out error!
2841	2841	10002841	20002841	L1_FLIPPER Axis over temp error!
2842	2842	10002842	20002842	L1_FLIPPER Axis motor connect error!
2843	2843	10002843	20002843	L1_FLIPPER Axis encoder connect error!
2844	2844	10002844	20002844	L1_FLIPPER Axis system halt error!
2845	2845	10002845	20002845	L1_FLIPPER Axis rom device error!
2846	2846	10002846	20002846	L1_FLIPPER Axis rom device error!
2847	2847	10002847	20002847	L1_FLIPPER Axis error! (all)
2848	2848	10002848	20002848	L1_FLIPPER Axis (+)limit error!

2849	2849	10002849	20002849	L1_FLIPPER Axis (-)limit error!
2850	2850	10002850	20002850	L1_FLIPPER Axis servo not ready!
2851	2851	10002851	20002851	L1_FLIP_ELELVATOR Axis S/W (-)limit error!
2852	2852	10002852	20002852	L1_FLIP_ELELVATOR Axis S/W (+)limit error!
2853	2853	10002853	20002853	L1_FLIP_ELELVATOR Axis motion Parameter (-)Limit error!
2854	2854	10002854	20002854	L1_FLIP_ELELVATOR Axis motion Parameter (+)Limit error!
2855	2855	10002855	20002855	L1_FLIP_ELELVATOR Axis position overflow error!
2856	2856	10002856	20002856	L1_FLIP_ELELVATOR Axis over current error!
2857	2857	10002857	20002857	L1_FLIP_ELELVATOR Axis over speed error!
2858	2858	10002858	20002858	L1_FLIP_ELELVATOR Axis position tracking error!
2859	2859	10002859	20002859	L1_FLIP_ELELVATOR Axis over load error!
2860	2860	10002860	20002860	L1_FLIP_ELELVATOR Axis over heat error!
2861	2861	10002861	20002861	L1_FLIP_ELELVATOR Axis back EMF error!
2862	2862	10002862	20002862	L1_FLIP_ELELVATOR Axis motor power error!
2863	2863	10002863	20002863	L1_FLIP_ELELVATOR Axis inposition error!
2864	2864	10002864	20002864	L1_FLIP_ELELVATOR Axis EMG status!
2865	2865	10002865	20002865	L1_FLIP_ELELVATOR Axis step out error!
2866	2866	10002866	20002866	L1_FLIP_ELELVATOR Axis over temp error!
2867	2867	10002867	20002867	L1_FLIP_ELELVATOR Axis motor connect error!
2868	2868	10002868	20002868	L1_FLIP_ELELVATOR Axis encoder connect error!
2869	2869	10002869	20002869	L1_FLIP_ELELVATOR Axis system halt error!
2870	2870	10002870	20002870	L1_FLIP_ELELVATOR Axis rom device error!
2871	2871	10002871	20002871	L1_FLIP_ELELVATOR Axis rom device error!
2872	2872	10002872	20002872	L1_FLIP_ELELVATOR Axis error! (all)
2873	2873	10002873	20002873	L1_FLIP_ELELVATOR Axis (+)limit error!
2874	2874	10002874	20002874	L1_FLIP_ELELVATOR Axis (-)limit error!
2875	2875	10002875	20002875	L1_FLIP_ELELVATOR Axis servo not ready!
2876	2876	10002876	20002876	RAIL2_WIDTH Axis S/W (-)limit error!
2877	2877	10002877	20002877	RAIL2_WIDTH Axis S/W (+)limit error!
2878	2878	10002878	20002878	RAIL2_WIDTH Axis motion Parameter (-)Limit error!
2879	2879	10002879	20002879	RAIL2_WIDTH Axis motion Parameter (+)Limit error!
2880	2880	10002880	20002880	RAIL2_WIDTH Axis position overflow error!
2881	2881	10002881	20002881	RAIL2_WIDTH Axis over current error!
2882	2882	10002882	20002882	RAIL2_WIDTH Axis over speed error!
2883	2883	10002883	20002883	RAIL2_WIDTH Axis position tracking error!
2884	2884	10002884	20002884	RAIL2_WIDTH Axis over load error!
2885	2885	10002885	20002885	RAIL2_WIDTH Axis over heat error!
2886	2886	10002886	20002886	RAIL2_WIDTH Axis back EMF error!

2887	2887	10002887	20002887	RAIL2_WIDTH Axis motor power error!
2888	2888	10002888	20002888	RAIL2_WIDTH Axis inposition error!
2889	2889	10002889	20002889	RAIL2_WIDTH Axis EMG status!
2890	2890	10002890	20002890	RAIL2_WIDTH Axis step out error!
2891	2891	10002891	20002891	RAIL2_WIDTH Axis over temp error!
2892	2892	10002892	20002892	RAIL2_WIDTH Axis motor connect error!
2893	2893	10002893	20002893	RAIL2_WIDTH Axis encoder connect error!
2894	2894	10002894	20002894	RAIL2_WIDTH Axis system halt error!
2895	2895	10002895	20002895	RAIL2_WIDTH Axis rom device error!
2896	2896	10002896	20002896	RAIL2_WIDTH Axis rom device error!
2897	2897	10002897	20002897	RAIL2_WIDTH Axis error! (all)
2898	2898	10002898	20002898	RAIL2_WIDTH Axis (+)limit error!
2899	2899	10002899	20002899	RAIL2_WIDTH Axis (-)limit error!
2900	2900	10002900	20002900	RAIL2_WIDTH Axis servo not ready!
2901	2901	10002901	20002901	L2_FLIPPER Axis S/W (-)limit error!
2902	2902	10002902	20002902	L2_FLIPPER Axis S/W (+)limit error!
2903	2903	10002903	20002903	L2_FLIPPER Axis motion Parameter (-)Limit error!
2904	2904	10002904	20002904	L2_FLIPPER Axis motion Parameter (+)Limit error!
2905	2905	10002905	20002905	L2_FLIPPER Axis position overflow error!
2906	2906	10002906	20002906	L2_FLIPPER Axis over current error!
2907	2907	10002907	20002907	L2_FLIPPER Axis over speed error!
2908	2908	10002908	20002908	L2_FLIPPER Axis position tracking error!
2909	2909	10002909	20002909	L2_FLIPPER Axis over load error!
2910	2910	10002910	20002910	L2_FLIPPER Axis over heat error!
2911	2911	10002911	20002911	L2_FLIPPER Axis back EMF error!
2912	2912	10002912	20002912	L2_FLIPPER Axis motor power error!
2913	2913	10002913	20002913	L2_FLIPPER Axis inposition error!
2914	2914	10002914	20002914	L2_FLIPPER Axis EMG status!
2915	2915	10002915	20002915	L2_FLIPPER Axis step out error!
2916	2916	10002916	20002916	L2_FLIPPER Axis over temp error!
2917	2917	10002917	20002917	L2_FLIPPER Axis motor connect error!
2918	2918	10002918	20002918	L2_FLIPPER Axis encoder connect error!
2919	2919	10002919	20002919	L2_FLIPPER Axis system halt error!
2920	2920	10002920	20002920	L2_FLIPPER Axis rom device error!
2921	2921	10002921	20002921	L2_FLIPPER Axis rom device error!
2922	2922	10002922	20002922	L2_FLIPPER Axis error! (all)
2923	2923	10002923	20002923	L2_FLIPPER Axis (+)limit error!
2924	2924	10002924	20002924	L2_FLIPPER Axis (-)limit error!

2925	2925	10002925	20002925	L2_FLIPPER Axis servo not ready!
2926	2926	10002926	20002926	L2_FLIP_ELELVATOR Axis S/W (-)limit error!
2927	2927	10002927	20002927	L2_FLIP_ELELVATOR Axis S/W (+)limit error!
2928	2928	10002928	20002928	L2_FLIP_ELELVATOR Axis motion Parameter (-)Limit error!
2929	2929	10002929	20002929	L2_FLIP_ELELVATOR Axis motion Parameter (+)Limit error!
2930	2930	10002930	20002930	L2_FLIP_ELELVATOR Axis position overflow error!
2931	2931	10002931	20002931	L2_FLIP_ELELVATOR Axis over current error!
2932	2932	10002932	20002932	L2_FLIP_ELELVATOR Axis over speed error!
2933	2933	10002933	20002933	L2_FLIP_ELELVATOR Axis position tracking error!
2934	2934	10002934	20002934	L2_FLIP_ELELVATOR Axis over load error!
2935	2935	10002935	20002935	L2_FLIP_ELELVATOR Axis over heat error!
2936	2936	10002936	20002936	L2_FLIP_ELELVATOR Axis back EMF error!
2937	2937	10002937	20002937	L2_FLIP_ELELVATOR Axis motor power error!
2938	2938	10002938	20002938	L2_FLIP_ELELVATOR Axis inposition error!
2939	2939	10002939	20002939	L2_FLIP_ELELVATOR Axis EMG status!
2940	2940	10002940	20002940	L2_FLIP_ELELVATOR Axis step out error!
2941	2941	10002941	20002941	L2_FLIP_ELELVATOR Axis over temp error!
2942	2942	10002942	20002942	L2_FLIP_ELELVATOR Axis motor connect error!
2943	2943	10002943	20002943	L2_FLIP_ELELVATOR Axis encoder connect error!
2944	2944	10002944	20002944	L2_FLIP_ELELVATOR Axis system halt error!
2945	2945	10002945	20002945	L2_FLIP_ELELVATOR Axis rom device error!
2946	2946	10002946	20002946	L2_FLIP_ELELVATOR Axis rom device error!
2947	2947	10002947	20002947	L2_FLIP_ELELVATOR Axis error! (all)
2948	2948	10002948	20002948	L2_FLIP_ELELVATOR Axis (+)limit error!
2949	2949	10002949	20002949	L2_FLIP_ELELVATOR Axis (-)limit error!
2950	2950	10002950	20002950	L2_FLIP_ELELVATOR Axis servo not ready!
2951	2951	10002951	20002951	RAIL3_WIDTH Axis S/W (-)limit error!
2952	2952	10002952	20002952	RAIL3_WIDTH Axis S/W (+)limit error!
2953	2953	10002953	20002953	RAIL3_WIDTH Axis motion Parameter (-)Limit error!
2954	2954	10002954	20002954	RAIL3_WIDTH Axis motion Parameter (+)Limit error!
2955	2955	10002955	20002955	RAIL3_WIDTH Axis position overflow error!
2956	2956	10002956	20002956	RAIL3_WIDTH Axis over current error!
2957	2957	10002957	20002957	RAIL3_WIDTH Axis over speed error!
2958	2958	10002958	20002958	RAIL3_WIDTH Axis position tracking error!
2959	2959	10002959	20002959	RAIL3_WIDTH Axis over load error!
2960	2960	10002960	20002960	RAIL3_WIDTH Axis over heat error!
2961	2961	10002961	20002961	RAIL3_WIDTH Axis back EMF error!
2962	2962	10002962	20002962	RAIL3_WIDTH Axis motor power error!

2963	2963	10002963	20002963	RAIL3_WIDTH Axis inposition error!
2964	2964	10002964	20002964	RAIL3_WIDTH Axis EMG status!
2965	2965	10002965	20002965	RAIL3_WIDTH Axis step out error!
2966	2966	10002966	20002966	RAIL3_WIDTH Axis over temp error!
2967	2967	10002967	20002967	RAIL3_WIDTH Axis motor connect error!
2968	2968	10002968	20002968	RAIL3_WIDTH Axis encoder connect error!
2969	2969	10002969	20002969	RAIL3_WIDTH Axis system halt error!
2970	2970	10002970	20002970	RAIL3_WIDTH Axis rom device error!
2971	2971	10002971	20002971	RAIL3_WIDTH Axis rom device error!
2972	2972	10002972	20002972	RAIL3_WIDTH Axis error! (all)
2973	2973	10002973	20002973	RAIL3_WIDTH Axis (+)limit error!
2974	2974	10002974	20002974	RAIL3_WIDTH Axis (-)limit error!
2975	2975	10002975	20002975	RAIL3_WIDTH Axis servo not ready!
3101	3101	10003101	20003101	Fail to make Memory for FOV. FOV information is empty.
3102	3102	10003102	20003102	Currunt inspection mode is manual mode but Currunt FOV is in Normal mode
3103	3103	10003103	20003103	Currunt inspection mode is normal mode but Currunt FOV is in Manual mode
3104	3104	10003104	20003104	Can not open XML Job file.
3105	3105	10003105	20003105	File [DualCamCalib.ini] does not exist or file is broken.Please check folder
3106	3106	10003106	20003106	An unexpected sequence error occurred between GUI and Vision interface.
3201	3201	10003201	20003201	Currunt Hard disk has not enough free space. Please disable image save all option.
3202	3202	10003202	20003202	RGB option is On but can not get RGB image captured.
3203	3203	10003203	20003203	Failed to load Simulation Images.
3204	3204	10003204	20003204	Pad Referencing Error.Failed to load PRDLL file .
3205	3205	10003205	20003205	CAM barcode library Error .
3206	3206	10003206	20003206	Errors occured while loading Z-Scale data at K-Smart.
3207	3207	10003207	20003207	Errors occured while loading Z-Scale data .
3208	3208	10003208	20003208	Global head type setting is wrong.
3209	3209	10003209	20003209	Failed to make Thread memory. ImageSize
3210	3210	10003210	20003210	Failed to make Thread memory .
3211	3211	10003211	20003211	Can not find Pad Reference Dongle key. Please check Dongle key is attached at USB Port
3212	3212	10003212	20003212	Can not use ZAxis option. Please uncheck
3213	3213	10003213	20003213	Vision Parameter Error.
3214	3214	10003214	20003214	PZT problem occur in reference image.
3215	3215	10003215	20003215	Failed to Save Reference Roataion image.
3216	3216	10003216	20003216	Failed to save Referece Image

3217	3217	10003217	20003217	Failed to save Referece step Image
3218	3218	10003218	20003218	Failed to save ZScale factor image to make reference
3219	3219	10003219	20003219	Got wrong vendor index while teaching Multi-vendor
3220	3220	10003220	20003220	Got too large Image area for teaching Multi-vendor. Please set smaller area.
3221	3221	10003221	20003221	Got too large image area for teaching Bad mark.
3222	3222	10003222	20003222	Can not find CAM Barcode dongle key or MIL version does not match current CAM Barcode version.
3223	3223	10003223	20003223	Failed to allocate Vision memory for Job
3224	3224	10003224	20003224	Failed to load reference data at KSmart
3225	3225	10003225	20003225	Failed to load reference data
3226	3226	10003226	20003226	Please check [Use ZAxis Calibration] option in Setting ==> Vision ==> ZCal tab
3227	3227	10003227	20003227	Failed to make Reference buffer
3228	3228	10003228	20003228	Error occured while creating reference data at Z-Calibration
3229	3229	10003229	20003229	Error occured while creating phase map at Z-Calibration
3230	3230	10003230	20003230	Error occured while creating leveled slope map at Z-Calibration
3231	3231	10003231	20003231	Error occured while creating non-leveled slope map at Z-Calibration
3232	3232	10003232	20003232	ZScale map out of range.(Detected particle scratch or target slope in sample) Please check Height calibration target an
3233	3233	10003233	20003233	Calibration paramter error
3234	3234	10003234	20003234	Please check [Use ZAxis Calibration] option in Setting ==> Vision ==> ZCal tab
3235	3235	10003235	20003235	Timeout occured while waiting for Inspection target
3236	3236	10003236	20003236	Can not find CAM Barcode dongle key or MIL version does not match current CAM Barcode version.
3237	3237	10003237	20003237	Job file does not match GBBT data. Please teach GBBT again.
3238	3238	10003238	20003238	PWG called with PWG option turned off.
3239	3239	10003239	20003239	ROI boundary count has over limit.
3240	3240	10003240	20003240	Pad referencing run with RGB option turned off. Please turn on RGB option and try again.
3241	3241	10003241	20003241	GBBT option turned on but failed to load GBBT data from job file. Please teach GBBT at Bare board teaching wizard or tu
3242	3242	10003242	20003242	There is no FM Master Teaching Data or Job file does not match with teaching data.
3243	3243	10003243	20003243	The Graphic card is not for FM Inspection or Failed to load Foreign Material library
3244	3244	10003244	20003244	HALCON library error
1000201	1000201	11000201	21000201	3D Reference Data does not exist!
1000300	1000300	11000300	21000300	Job file does not exist!
1001100	1001100	11001100	21001100	Inspection Error! Failed to get inspection result.
1020100	1020100	11020100	21020100	Not enough space to save data!
1040300	1040300	11040300	21040300	Input PAD ID again.

1040600	1040600	11040600	21040600	The PCB information does not exist!
1040700	1040700	11040700	21040700	Can't find Inspection Result!
1050101	1050101	11050101	21050101	PCB size is bigger than max conveyor size!
1050102	1050102	11050102	21050102	Change Conveyor Width Adjustment value.
1060100	1060100	11060100	21060100	Manual Move Action failed.
1170100	1170100	11170100	21170100	Failed to save Coplanarity!
1190100	1190100	11190100	21190100	Failed to save Document!
1210100	1210100	11210100	21210100	Failed to save Fiducial Teaching image!
1210201	1210201	11210201	21210201	Wrong Fiducial Information!
1240100	1240100	11240100	21240100	Failed to save Mask!
1250200	1250200	11250200	21250200	Can't find PCB Inspection Result!
1250300	1250300	11250300	21250300	Can't find Result data in Database!
1250400	1250400	11250400	21250400	Can't find PCB Inspection Result!
1260101	1260101	11260101	21260101	Inspection Failed (PZT Error)
1260200	1260200	11260200	21260200	Load Job File and try again.
1260300	1260300	11260300	21260300	PCB has too much rotation!
1260500	1260500	11260500	21260500	Select Inspection ROI and try again.
1260600	1260600	11260600	21260600	Error during Inspection Function!
1260900	1260900	11260900	21260900	Move to Next Inspection Step
1261001	1261001	11261001	21261001	Fiducial Inspection Error. Try again!
1261100	1261100	11261100	21261100	Load Job File and Try again.
1261200	1261200	11261200	21261200	PCB is rotated too much!
1261300	1261300	11261300	21261300	Error in Inspection Function!
1280100	1280100	11280100	21280100	System Information is not available!
1290200	1290200	11290200	21290200	Load Job File or set Fiducial and Array No.
1320100	1320100	11320100	21320100	Failed to save barcode
1430200	1430200	11430200	21430200	EMERGENCY button pressed!
1440101	1440101	11440101	21440101	Global Fiducial doesn't Exist

Machine Type : AOI

ID	Name	Set CE	Clear CE	Text
2	2	10000002	20000002	Fiducial Error
6	6	10000006	20000006	Defect pad on this PCB!
7	7	10000007	20000007	Entry Converyor Loading failed!
8	8	10000008	20000008	Work Converyor Loading failed!
9	9	10000009	20000009	Exit Converyor Loading failed!
12	12	10000012	20000012	PCB Loading/Unloading failed!
13	13	10000013	20000013	Manual Motion failed!

14	14	10000014	20000014	Air Pressure Level is too low!
17	17	10000017	20000017	Failed to adjust Entry Converyor Width!
18	18	10000018	20000018	Failed to adjust Work Converyor Width!
19	19	10000019	20000019	Failed to adjust Exit Converyor Width!
20	20	10000020	20000020	Error not defined.
21	21	10000021	20000021	Failed to find the Fiducials!
22	22	10000022	20000022	PCB has too much Rotation.
23	23	10000023	20000023	ZENITH_ERROR_FIDUCIAL_AFTER_JOBCHANGE
31	31	10000031	20000031	ZENITH_ERROR_DB
32	32	10000032	20000032	ZENITH_ERROR_BARCODE
33	33	10000033	20000033	ZENITH_ERROR_CAMBAR
34	34	10000034	20000034	ZENITH_ERROR_GRABBER
35	35	10000035	20000035	ZENITH_ERROR_NOTRETURNFROMMES
36	36	10000036	20000036	ZENITH_ERROR_NG_FROMMES
37	37	10000037	20000037	ZENITH_ERROR_READBARCODE
38	38	10000038	20000038	ZENITH_ERROR_CONFSTOP
39	39	10000039	20000039	ZENITH_ERROR_RESULT_SAVE_TIMEOUT
40	40	10000040	20000040	ZENITH_ERROR_DB_CREATE_FAIL
50	50	10000050	20000050	ZENITH_ERROR_DS_DISCONNECTED
51	51	10000051	20000051	ZENITH_ERROR_DS_HARDDISK_NOSPACE
52	52	10000052	20000052	ZENITH_ERROR_DS_DB_DISCONNECTED
53	53	10000053	20000053	ZENITH_ERROR_DS_MEMORY
54	54	10000054	20000054	ZENITH_ERROR_DS_UNKNOWN
55	55	10000055	20000055	ZENITH_ERROR_NG_FROMNETSERVER
56	56	10000056	20000056	ZENITH_ERROR_COVERAGEREPORT
60	60	10000060	20000060	ZENITH_ERROR_BARCODE_EXCEPTION_IN_VISION
61	61	10000061	20000061	ZENITH_ERROR_JOBCHANGE_TIMEOUT
62	62	10000062	20000062	ZENITH_ERROR_DB_SAVE_RESULT
63	63	10000063	20000063	ZENITH_ERROR_WAITDONE_BARACTION
70	70	10000070	20000070	ZENITH_ERROR_9WAY_MIRRORSENSOR_NODETECT
71	71	10000071	20000071	ZENITH_ERROR_GRABBER_NO_RESPONSE
100	100	10000100	20000100	ZENITH_ERROR_NOT_FIND_JOBLINK
101	101	10000101	20000101	ZENITH_ERROR_BARCODE_RANGE
102	102	10000102	20000102	ZENITH_ERROR_INSPECT_FUNCTION
103	103	10000103	20000103	ZENITH_ERROR_RESET_STATUS_WRONG
104	104	10000104	20000104	ZENITH_ERROR_REVIEW_JUDGE_TIMEOUT
105	105	10000105	20000105	ZENITH_ERROR_PCB_ARRAY_BARCODE_MISSMATCHING
106	106	10000106	20000106	ZENITH_ERROR_IMAGE_SANITY_CHECK

107	107	10000107	20000107	ZENITH_ERROR_REVERSEPCBMODE_NOTEXISTBARCODE_INDB
200	200	10000200	20000200	VTM_ERROR_PENDING_INSPECTION
201	201	10000201	20000201	RESULT_ERROR_PENDING_INSPECTION
202	202	10000202	20000202	VTM_ERROR_PENDING_WORKLIST
203	203	10000203	20000203	VTM_ERROR_TIMEOUT_GRAB_OUTPOOL
204	204	10000204	20000204	VTM_ERROR_NONPAGED
300	300	10000300	20000300	VISION_PLATFORM_ERROR_JOB_OPEN
301	301	10000301	20000301	VISION_PLATFORM_ERROR_CREATE_MACHINE
302	302	10000302	20000302	VISION_PLATFORM_ERROR_CREATE_ENGINE
303	303	10000303	20000303	VISION_PLATFORM_ERROR_SYNC_TASK
304	304	10000304	20000304	VISION_PLATFORM_ERROR_START_PROC
305	305	10000305	20000305	VISION_PLATFORM_ERROR_FEED_DATA
306	306	10000306	20000306	VISION_PLATFORM_ERROR_END_PROC
307	307	10000307	20000307	VISION_PLATFORM_ERROR_WAIT_FOR_ALL
308	308	10000308	20000308	VISION_PLATFORM_ERROR_GET_RESOURCE
309	309	10000309	20000309	VISION_PLATFORM_ERROR_RESET
310	310	10000310	20000310	VISION_PLATFORM_ERROR_STOP
900	900	10000900	20000900	There is a PCB in the Multi Rack!
901	901	10000901	20000901	NG Rack is full of PCBs!
902	902	10000902	20000902	There is a PCB in NG Rack!
903	903	10000903	20000903	Not registered BBT-Vendor name!
904	904	10000904	20000904	No Multi-Vendor Teaching (position) value!
905	905	10000905	20000905	No BBT information registered!
906	906	10000906	20000906	There are some problems about PZT Movement.
907	907	10000907	20000907	The gray Level of left image's brightness is less 10.
908	908	10000908	20000908	The gray Level of right image's brightness is less 10.
909	909	10000909	20000909	A software error such as memory allocation is occured during the inspecting
910	910	10000910	20000910	Fiducial Inspection Error
911	911	10000911	20000911	MEMORY ALLOCATION Error
912	912	10000912	20000912	Inspection Result Reading Error
999	999	10000999	20000999	There are PCBs in Multi Rack!
1000	1000	10001000	20001000	PCB failed to arrive at ENTRY IN sensor!
1001	1001	10001001	20001001	PCB failed to pass ENTRY IN sensor!
1002	1002	10001002	20001002	PCB failed to arrive at ENTRY OUT sensor!
1003	1003	10001003	20001003	PCB failed to pass ENTRY OUT sensor!
1004	1004	10001004	20001004	Work IN sensor failed to detect PCB!
1005	1005	10001005	20001005	PCB failed to arrive at WORK SLOW sensor!

1006	1006	10001006	20001006	PCB failed to arrive at WORK OUT sensor!
1007	1007	10001007	20001007	PCB failed to pass WORK OUT sensor!
1008	1008	10001008	20001008	WORK IN/OUT sensors detected PCB at the same time!
1009	1009	10001009	20001009	EXIT IN sensor failed to detect PCB!
1010	1010	10001010	20001010	PCB failed to pass EXIT IN sensor!
1011	1011	10001011	20001011	PCB failed to arrive at EXIT OUT sensor!
1012	1012	10001012	20001012	PCB failed to pass EXIT OUT sensor!
1013	1013	10001013	20001013	Stencil needs to be replaced!
1014	1014	10001014	20001014	PCB did not arrive at FRONT ENTRY IN sensor.
1015	1015	10001015	20001015	PCB is jammed at FRONT ENTRY IN sensor.
1016	1016	10001016	20001016	PCB did not arrive at FRONT WORK OUT sensor.
1017	1017	10001017	20001017	PCB is jammed at FRONT WORK OUT sensor.
1018	1018	10001018	20001018	PCB did not arrive at FRONT EXIT OUT sensor.
1019	1019	10001019	20001019	PCB is jammed at FRONT EXIT OUT sensor.
1020	1020	10001020	20001020	PCB did not arrive at REAR ENTRY IN sensor.
1021	1021	10001021	20001021	PCB is jammed at WORK IN sensor.
1022	1022	10001022	20001022	There is a problem in UpStream SMEMA In.
1023	1023	10001023	20001023	There is a problem with Upstream SMEMA Out.
1024	1024	10001024	20001024	There is a problem with DownStream SMEMA In.
1025	1025	10001025	20001025	There is a problem with DownStream SMEMA Out.
1026	1026	10001026	20001026	All of Rail Up and Down Sensor is detected.
1028	1028	10001028	20001028	None of Rail Up and Down Sensor is detected.
1029	1029	10001029	20001029	Twist Rail Up/Donw Sensor Cable.
1031	1031	10001031	20001031	FRONT ENTRY RAIL UP SENSOR not checked.
1032	1032	10001032	20001032	FRONT ENTRY RAIL DOWN SENSOR not checked.
1033	1033	10001033	20001033	FRONT WORK RAIL UP SENSOR not checked.
1034	1034	10001034	20001034	FRONT WORK RAIL DOWN SENSOR not checked.
1035	1035	10001035	20001035	FRONT EXIT RAIL UP SENSOR not checked.
1036	1036	10001036	20001036	FRONT EXIT RAIL DOWN SENSOR not checked.
1037	1037	10001037	20001037	FRONT RACK1 CYLINDER UP SENSOR not checked.
1038	1038	10001038	20001038	FRONT RACK1 CYLINDER UP SENSOR not released
1039	1039	10001039	20001039	FRONT RACK2 CYLINDER UP Sensors not checked.
1040	1040	10001040	20001040	FRONT RACK1 CYLINDER UP SENSOR not released
1041	1041	10001041	20001041	REAR ENTRY RAIL UP SENSOR not checked.
1042	1042	10001042	20001042	REAR ENTRY RAIL DOWN SENSOR not checked.
1043	1043	10001043	20001043	REAR WORK RAIL UP SENSOR not checked.
1044	1044	10001044	20001044	REAR WORK RAIL DOWN SENSOR not checked.
1045	1045	10001045	20001045	REAR EXIT RAIL UP SENSOR not checked.

1046	1046	10001046	20001046	REAR EXIT RAIL DOWN SENSOR not checked.
1050	1050	10001050	20001050	PCB is jammed at REAR ENTRY IN sensor.
1051	1051	10001051	20001051	PCB did not arrive at REAR WORK OUT sensor.
1052	1052	10001052	20001052	PCB is jammed at REAR WORK OUT sensor.
1053	1053	10001053	20001053	PCB did not arrive at REART EXIT OUT sensor.
1054	1054	10001054	20001054	PCB is jammed at REAR EXIT OUT sensor.
1055	1055	10001055	20001055	There has some problem during PCB moving.
1056	1056	10001056	20001056	Conveyor Error Cleared.
1057	1057	10001057	20001057	REAR RACK1 CYLINDER UP SENSOR not checked.
1058	1058	10001058	20001058	REAR RACK1 CYLINDER UP SENSOR not released.
1059	1059	10001059	20001059	REAR RACK2 CYLINDER UP SENSOR not checked.
1060	1060	10001060	20001060	REAR RACK2 CYLINDER UP SENSOR not released.
1088	1088	10001088	20001088	There is a PCB between conveyors!
1089	1089	10001089	20001089	There is no PCB on Work Converyor!
1091	1091	10001091	20001091	Bad Marking Cylinder shows false movements!
1093	1093	10001093	20001093	PCB detected on conveyors!
1100	1100	10001100	20001100	PCB failed to arrive at MR EXIT CHECK sensor!
1101	1101	10001101	20001101	PCB failed to arrive at MR EXIT IN sensor!
1102	1102	10001102	20001102	PCB failed to pass MR EXIT IN sensor!
1103	1103	10001103	20001103	PCB failed to arrive at MR EXIT OUT sensor!
1104	1104	10001104	20001104	PCB failed to pass MR EXIT IN sensor!
1105	1105	10001105	20001105	NG_PCB does not exist in MODE
1106	1106	10001106	20001106	PCB is located at wrong position in Multi Rack
1107	1107	10001107	20001107	GOOD_PCB did not become compulsorily the discharge in MODE
1108	1108	10001108	20001108	WORK IN/OUT sensors detected PCB at the same time!
1109	1109	10001109	20001109	PCB check sensor at Exit Conveyor detected wrong object!
1111	1111	10001111	20001111	MR EXIT STOPPER Cyliner shows wrong movement!
1112	1112	10001112	20001112	MR EXIT IN Cylinder Off sensor failed to work!
1113	1113	10001113	20001113	MR EXIT IN Cylinder On sensor failed to work!
1114	1114	10001114	20001114	MR EXIT OUT Cylinder Off sensor failed to work!
1115	1115	10001115	20001115	MR EXIT OUT Cylinder On sensor failed to work!
1117	1117	10001117	20001117	There is no NG PCB in NG Rack!
1119	1119	10001119	20001119	Multi Rack is opened!
1121	1121	10001121	20001121	MR EXIT IN Sensor detected a PCB!
1123	1123	10001123	20001123	MR PCB IN Sensor detected a PCB!
1125	1125	10001125	20001125	MR EXIT BELT END Sensor detected a PCB!
1127	1127	10001127	20001127	MR EXIT OUT Sensor detected a PCB!
1129	1129	10001129	20001129	MR Z axis shows false movements!

1130	1130	10001130	20001130	There are some problems during Conveyor Width adjustment.
1132	1132	10001132	20001132	Machine does not have conveyor width home position!
1133	1133	10001133	20001133	Machine had emergency status during conveyor width adjustment.
1135	1135	10001135	20001135	Fiducial inspection error
1141	1141	10001141	20001141	PCB failed to pass FRONT RACK1 BUFFER IN sensor.
1142	1142	10001142	20001142	PCB did not arrive at FRONT RACK1 BUFFER OUT sensor.
1143	1143	10001143	20001143	PCB failed to pass FRONT RACK1 BUFFER OUT sensor.
1144	1144	10001144	20001144	Unknown PCB is detected in FRONT RACK1 BUFFER sensor.
1145	1145	10001145	20001145	Unknown PCB is detected in FRONT RACK2 BUFFER sensor.
1146	1146	10001146	20001146	PCB is removed in FRONT RACK1 BUFFER sensor.
1147	1147	10001147	20001147	PCB is removed in FRONT RACK2 BUFFER sensor.
1148	1148	10001148	20001148	FRONT RACK is full by NG PCB.
1151	1151	10001151	20001151	PCB failed to pass REAR RACK1 BUFFER IN sensor.
1152	1152	10001152	20001152	PCB did not arrive at REAR RACK1 BUFFER OUT sensor.
1153	1153	10001153	20001153	PCB failed to pass REAR RACK1 BUFFER OUT sensor.
1154	1154	10001154	20001154	Unknown PCB is detected in REAR RACK1 BUFFER sensor.
1155	1155	10001155	20001155	Unknown PCB is detected in REAR RACK2 BUFFER sensor.
1156	1156	10001156	20001156	PCB is removed in REAR RACK1 BUFFER sensor.
1157	1157	10001157	20001157	PCB is removed in REAR RACK2 BUFFER sensor.
1158	1158	10001158	20001158	REAR RACK is full by NG PCB.
1161	1161	10001161	20001161	PCB did not arrive at FRONT ENTRY IN sensor.
1162	1162	10001162	20001162	PCB is jammed at FRONT ENTRY IN sensor.
1163	1163	10001163	20001163	PCB did not arrive at FRONT ENTRY OUT sensor.
1164	1164	10001164	20001164	PCB is jammed at FRONT ENTRY OUT sensor.
1165	1165	10001165	20001165	PCB did not arrive at FRONT WORK IN sensor.
1166	1166	10001166	20001166	PCB is jammed at FRONT WORK IN sensor.
1167	1167	10001167	20001167	PCB did not arrive at FRONT WORK OUT sensor.
1168	1168	10001168	20001168	PCB is jammed at FRONT WORK OUT sensor.
1169	1169	10001169	20001169	PCB did not arrive at FRONT EXIT IN sensor.
1170	1170	10001170	20001170	PCB is jammed at FRONT EXIT IN sensor.
1171	1171	10001171	20001171	PCB did not arrive at FRONT EXIT OUT sensor.
1172	1172	10001172	20001172	PCB is jammed at FRONT EXIT OUT sensor.
1173	1173	10001173	20001173	There are two PCB on FRONT Conveyor.
1178	1178	10001178	20001178	There are PCB that for a long time waiting to FRONT CONVEYOR.
1181	1181	10001181	20001181	PCB did not arrive at REAR ENTRY IN sensor.
1182	1182	10001182	20001182	PCB is jammed at REAR ENTRY IN sensor.
1183	1183	10001183	20001183	PCB did not arrive at REAR ENTRY OUT sensor.
1184	1184	10001184	20001184	PCB is jammed at REAR ENTRY OUT sensor.

1185	1185	10001185	20001185	PCB did not arrive at REAR WORK IN sensor.
1186	1186	10001186	20001186	PCB is jammed at REAR WORK IN sensor.
1187	1187	10001187	20001187	PCB did not arrive at REAR WORK OUT sensor.
1188	1188	10001188	20001188	PCB is jammed at REAR WORK OUT sensor.
1189	1189	10001189	20001189	PCB did not arrive at REAR EXIT IN sensor.
1190	1190	10001190	20001190	PCB is jammed at REAR EXIT IN sensor.
1191	1191	10001191	20001191	PCB did not arrive at REAR EXIT OUT sensor.
1192	1192	10001192	20001192	PCB is jammed at REAR EXIT OUT sensor.
1193	1193	10001193	20001193	There are two PCB on REAR Conveyor.
1194	1194	10001194	20001194	FRONT Work Stopper Up Sensor was not perceived.
1195	1195	10001195	20001195	FRONT Work Stopper Down Sensor was not perceived.
1196	1196	10001196	20001196	REAR Work Stopper Up Sensor was not perceived.
1197	1197	10001197	20001197	REAR Work Stopper Down Sensor was not perceived.
1198	1198	10001198	20001198	There are PCB that for a long time waiting to REAR CONVEYOR.
1200	1200	10001200	20001200	WFTPD.exe is not running!
1201	1201	10001201	20001201	EMERGENCY button pressed or Front Door is open!
1202	1202	10001202	20001202	Low air pressure!
1203	1203	10001203	20001203	Motion Control PC(RTPC) shows false movements!
1204	1204	10001204	20001204	Front door is opened!
1205	1205	10001205	20001205	Motion Board Initialization failed so WinMCS Program is going to shut down.
1206	1206	10001206	20001206	IO Board Initialization is failed so WinMCS Program is going to shut down.
1207	1207	10001207	20001207	Serial communication error with STMC.
1208	1208	10001208	20001208	Front Door is opened.
1209	1209	10001209	20001209	Rear Door is opened.
1210	1210	10001210	20001210	There is a Communication Error with STMC Board.
1211	1211	10001211	20001211	Servo not Ready State.
1212	1212	10001212	20001212	The Contorl Power is OFF.
1213	1213	10001213	20001213	The Contorl Power is OFF.
1214	1214	10001214	20001214	The Contorl Power is OFF.
1215	1215	10001215	20001215	Dust detected in PCB.
1216	1216	10001216	20001216	High air pressure.
1220	1220	10001220	20001220	Fiducial Result Error
1700	1700	10001700	20001700	PZT AMP detected false signal!
1800	1800	10001800	20001800	CamBarcode Time Out Error
1801	1801	10001801	20001801	BadMarker Time Out Error
1802	1802	10001802	20001802	MultiVender Time Out Error
2000	2000	10002000	20002000	Servo Not Ready!

2001	2001	10002001	20002001	X Axis Limit Error!
2002	2002	10002002	20002002	Y Axis Limit Error!
2003	2003	10002003	20002003	Z Axis Limit Error!
2004	2004	10002004	20002004	X Axis Position Error!
2005	2005	10002005	20002005	Y Axis Position Error!
2006	2006	10002006	20002006	Z Axis Position Error!
2007	2007	10002007	20002007	M Axis Position Error!
2008	2008	10002008	20002008	M Axis Limit Error!
2009	2009	10002009	20002009	U Axis Position Error!
2010	2010	10002010	20002010	V Axis Position Error!
2011	2011	10002011	20002011	Failed to read SST file!
2013	2013	10002013	20002013	Failed to read Job file!
2014	2014	10002014	20002014	Fail to read LampUserSet file.
2016	2016	10002016	20002016	Axis moving command is exceed hardware Positive limit
2017	2017	10002017	20002017	Axis moving commandhas exceeded hardware Negative limit
2019	2019	10002019	20002019	U Axis Motor AMP is not READY.
2020	2020	10002020	20002020	V Axis Motor AMP is not READY.
2021	2021	10002021	20002021	X Axis Motor AMP is not READY.
2022	2022	10002022	20002022	Y Axis Motor AMP is not READY.
2023	2023	10002023	20002023	Z Axis Motor AMP is not READY.
2024	2024	10002024	20002024	M Axis Motor AMP is not READY.
2025	2025	10002025	20002025	X Axis Motor AMP is not Servo On.
2026	2026	10002026	20002026	Y Axis Motor AMP is not Servo On
2027	2027	10002027	20002027	Z Axis Motor AMP is not Servo On
2028	2028	10002028	20002028	U Axis Motor AMP is not Servo On
2029	2029	10002029	20002029	V Axis Motor AMP is not Servo On
2031	2031	10002031	20002031	X axis checked (-)limit sensor.
2032	2032	10002032	20002032	Y axis checked (-)limit sensor.
2033	2033	10002033	20002033	Z axis checked (-)limit sensor.
2034	2034	10002034	20002034	M axis checked (-)limit sensor.
2036	2036	10002036	20002036	X axis checked (+)limit sensor.
2037	2037	10002037	20002037	Y axis checked (+)limit sensor.
2038	2038	10002038	20002038	Z axis checked (+)limit sensor.
2039	2039	10002039	20002039	M axis checked (+)limit sensor.
2041	2041	10002041	20002041	Emergency status happened during homing.
2042	2042	10002042	20002042	Job file command position is above Motion Stroke Length.
2045	2045	10002045	20002045	Did not remove PCB of Inside NG_Buffer
2046	2046	10002046	20002046	Did not remove PCB of inside NG_Buffer

2047	2047	10002047	20002047	Motion dose not move to the Inspection Position
2048	2048	10002048	20002048	U Axis Position Error.
2049	2049	10002049	20002049	Y Axis Position Error.
2050	2050	10002050	20002050	U axis checked (-)limit sensor.
2051	2051	10002051	20002051	Y axis checked (-)limit sensor.
2052	2052	10002052	20002052	U axis checked (+)limit sensor..
2053	2053	10002053	20002053	Y axis checked (+)limit sensor.
2080	2080	10002080	20002080	Communication Error
2101	2101	10002101	20002101	Head motor and Lens motor shows different transfer value!
2102	2102	10002102	20002102	Lens motor and Head motor shows different transfer value!
2201	2201	10002201	20002201	Conveyors are still moving.
2203	2203	10002203	20002203	Machine does not Move.
2204	2204	10002204	20002204	Machine Basic Setting is Changed.
2300	2300	10002300	20002300	Head StepServo Motor Amp is not in Servo On status.
2301	2301	10002301	20002301	Head StepServo Motor Postive Limit Error.
2302	2302	10002302	20002302	Lens StepServo Motor Amp is not Servo On.
2303	2303	10002303	20002303	Lens StepServo Motor Postive Limit Error.
2304	2304	10002304	20002304	StepZoom Motor Moving Time Out.
2305	2305	10002305	20002305	StepZoom Motor Following Error.
2306	2306	10002306	20002306	Head Motor Communication Error.
2307	2307	10002307	20002307	Lens Motor Communication Error.
2308	2308	10002308	20002308	Head StepServo Received Error.
2309	2309	10002309	20002309	Lens StepServo Received Error.
2310	2310	10002310	20002310	Conveyor Width Setting Value Error.
2311	2311	10002311	20002311	Conveyor Command Value is Under the Minimum Value.
2312	2312	10002312	20002312	Conveyor Command Value is Over the Maximum Value.
2410	2410	10002410	20002410	Front Lane UpStream SMEMA In Error.
2411	2411	10002411	20002411	Rear Lane UpStream SMEMA In Error.
2412	2412	10002412	20002412	Front Lane DownStream SMEMA In Error.
2413	2413	10002413	20002413	Rear Lane DownStream SMEMA In Error.
2415	2415	10002415	20002415	Conveyor Rail 1 & 2 Collision Error.
2416	2416	10002416	20002416	Conveyor Rail 2 & 3 Collision Error.
2417	2417	10002417	20002417	Conveyor Rail 3 & 4 Collision1 Error.
2418	2418	10002418	20002418	Conveyor Rail 3 & 4 Collision2 Error.
2419	2419	10002419	20002419	Conveyor Backup Unit Collision Error.
2420	2420	10002420	20002420	Rail1 Command is Collision Position against Rail2.
2421	2421	10002421	20002421	Rail2 Command is Collision Position against Rail1.
2422	2422	10002422	20002422	Rail2 Command is Collision Position against Rail3.

2423	2423	10002423	20002423	Rail3 Command is Collision Position against Rail2.
2424	2424	10002424	20002424	Rail3 Command is Collision Position against Rail4.
2425	2425	10002425	20002425	Rail4 Command is Collision Position against Rail3.
2430	2430	10002430	20002430	NG-PCB was not removed.
2431	2431	10002431	20002431	Checked Front Lane PCB Collision Sensor.
2432	2432	10002432	20002432	Checked Rear Lane PCB Collision Sensor.
2433	2433	10002433	20002433	Please Check GUI Error Message
2434	2434	10002434	20002434	Backup Pin Unit Setting is Changed.
2435	2435	10002435	20002435	Before Conveyor Width adjustment
2436	2436	10002436	20002436	Conveyor Width adjustment done
2437	2437	10002437	20002437	Checked Front Lane PCB Collision Sensor.
2438	2438	10002438	20002438	Checked Front Lane PCB Work Out Collision Sensor.
2440	2440	10002440	20002440	The laser for Auto focus fails to find a focus height.
2441	2441	10002441	20002441	MCS did not get PCB Defect Result of Lane1.
2442	2442	10002442	20002442	MCS did not get PCB Defect Result of Lane2.
2443	2443	10002443	20002443	MCS did not read Job file.
2500	2500	10002500	20002500	There are some Communication Error of Laser System.
2600	2600	10002600	20002600	Motion Gain Value Error.
2601	2601	10002601	20002601	Axis Encoder Error.
2602	2602	10002602	20002602	Motion Following Error.
2603	2603	10002603	20002603	Checked Hardware Conveyor Manual Switch On.
2604	2604	10002604	20002604	There some Problem on Initializing STMC Board.
2605	2605	10002605	20002605	It needs enough review and aging test.
2606	2606	10002606	20002606	X_AXIS Motion Following
2607	2607	10002607	20002607	Y_AXIS Motion Following Error.
2608	2608	10002608	20002608	Entry Shuttle Motion Following Error.
2609	2609	10002609	20002609	Exit Shuttle Motion Following Error.
2610	2610	10002610	20002610	Dispenser Z-Axis Motion Following Error.
2611	2611	10002611	20002611	Checked Rail 1 Up Sensor.
2612	2612	10002612	20002612	It does not Check Rail 1 Up Sensor.
2613	2613	10002613	20002613	Checked Rail 2 Up Sensor.
2614	2614	10002614	20002614	It does not Check Rail 2 Up Sensor.
2615	2615	10002615	20002615	Checked Rail 1/2 Up Sensor.
2616	2616	10002616	20002616	It does not Check 1/2 Up Sensor.
2618	2618	10002618	20002618	Motion Done TimeOut Error
2620	2620	10002620	20002620	Checked Front Side Pusher Up Sensor.
2621	2621	10002621	20002621	Checked Front Side Pusher Down Sensor.
2622	2622	10002622	20002622	Checked Rear Side Pusher Up Sensor.

2623	2623	10002623	20002623	Checked Rear Side Pusher Down Sensor.
2650	2650	10002650	20002650	Long BarCodeTeaching Error
2651	2651	10002651	20002651	Max Warpage Limit Error
2652	2652	10002652	20002652	Board Inspection TimeOut Error
2653	2653	10002653	20002653	Max Shrinkage Limit Error
2661	2661	10002661	20002661	Conveyor Rail1 Checked Home Sensor.
2662	2662	10002662	20002662	Conveyor Rail2 Checked Home Sensor.
2663	2663	10002663	20002663	Conveyor Rail3 Checked Home Sensor.
2664	2664	10002664	20002664	Conveyor Rail4 Checked Home Sensor.
2665	2665	10002665	20002665	Change Downstream Conveyor adjust timeout error.
2666	2666	10002666	20002666	It is Upstream EMG.
2667	2667	10002667	20002667	It is Downstream EMG.
2668	2668	10002668	20002668	PCB did not arrive at Work OUT sensor from Entry.
2669	2669	10002669	20002669	Current conveyor width is same as set PCB width.
2670	2670	10002670	20002670	PCB verification result time out error.
2671	2671	10002671	20002671	Door Lock error
2672	2672	10002672	20002672	Entry Conv Width Limit error
2673	2673	10002673	20002673	Work Conv Width Limit error
2674	2674	10002674	20002674	Exit Conv Width Limit error
2675	2675	10002675	20002675	There is not inspected PCB.
2676	2676	10002676	20002676	Inspection result is NG.
2677	2677	10002677	20002677	Vacuum pressure sensor is not detected.
2678	2678	10002678	20002678	Vacuum pressure sensor is not turned off.
2679	2679	10002679	20002679	Lane1 P Machine Info Ack Timeout Error
2680	2680	10002680	20002680	Lane2 P Machine Info Ack Timeout Error
2681	2681	10002681	20002681	Barcode Shuttle Limit Sensor Error.
2682	2682	10002682	20002682	Barcode Shuttle located Home.
2683	2683	10002683	20002683	Barcode Shuttle does not operate normally.
2684	2684	10002684	20002684	Barcode Shuttle command exceeds the maximum value set.
2685	2685	10002685	20002685	Barcode Shuttle command less the minimum value set.
2686	2686	10002686	20002686	Dispenser Purge error.
2687	2687	10002687	20002687	Dispenser Syringe air pressure limit error.
2701	2701	10002701	20002701	The Back-up Plate Clamp is open
2711	2711	10002711	20002711	Lane1 Height Guide Sensor Error
2712	2712	10002712	20002712	Lane2 Height Guide Sensor Error
2713	2713	10002713	20002713	Conveyor Home Move exceeded the time.
2714	2714	10002714	20002714	Flipper Home Move exceeded the time.
2715	2715	10002715	20002715	Flipper Move exceeded the time.

2716	2716	10002716	20002716	Failed to Move. (Home)
2717	2717	10002717	20002717	Failed to Move.
2800	2800	10002800	20002800	Command sync error
2801	2801	10002801	20002801	Fail to renewal origin of machine
2802	2802	10002802	20002802	Tryed to turn servo on while Alarming
2803	2803	10002803	20002803	Tryed to turn servo on while Emergency mode
2804	2804	10002804	20002804	Please press OK after releasing bolt of backup pin unit
2810	2810	10002810	20002810	Lane1 entry plate up/down cylinder shows false movements!
2811	2811	10002811	20002811	Lane1 entry turn cylinder shows false movements!
2812	2812	10002812	20002812	Lane1 flip stage elevator Axis shows false movements! (Homming)
2813	2813	10002813	20002813	Lane1 flip stage elevator Axis shows false movements! (Moving)
2814	2814	10002814	20002814	Lane1 flip stage bridge cylinder shows false movements!
2815	2815	10002815	20002815	Lane1 flip stage gear cylinder shows false movements!
2816	2816	10002816	20002816	Unknown PCB is detected in lane1.
2817	2817	10002817	20002817	Lane2 entry plate up/down cylinder shows false movements!
2818	2818	10002818	20002818	Lane2 entry turn cylinder shows false movements!
2819	2819	10002819	20002819	Lane2 flip stage elevator Axis shows false movements! (Homming)
2820	2820	10002820	20002820	Lane2 flip stage elevator Axis shows false movements! (Moving)
2821	2821	10002821	20002821	Lane2 flip stage bridge cylinder shows false movements!
2822	2822	10002822	20002822	Lane2 flip stage gear cylinder shows false movements!
2823	2823	10002823	20002823	Unknown PCB is detected in lane2.
2824	2824	10002824	20002824	Flip stage elevator Axis shows false movements!
2825	2825	10002825	20002825	Conveyor sensor detected.
2826	2826	10002826	20002826	L1_FLIPPER Axis S/W (-)limit error!
2827	2827	10002827	20002827	L1_FLIPPER Axis S/W (+)limit error!
2828	2828	10002828	20002828	L1_FLIPPER Axis motion Parameter (-)Limit error!
2829	2829	10002829	20002829	L1_FLIPPER Axis motion Parameter (+)Limit error!
2830	2830	10002830	20002830	L1_FLIPPER Axis position overflow error!
2831	2831	10002831	20002831	L1_FLIPPER Axis over current error!
2832	2832	10002832	20002832	L1_FLIPPER Axis over speed error!
2833	2833	10002833	20002833	L1_FLIPPER Axis position tracking error!
2834	2834	10002834	20002834	L1_FLIPPER Axis over load error!
2835	2835	10002835	20002835	L1_FLIPPER Axis over heat error!
2836	2836	10002836	20002836	L1_FLIPPER Axis back EMF error!
2837	2837	10002837	20002837	L1_FLIPPER Axis motor power error!
2838	2838	10002838	20002838	L1_FLIPPER Axis inposition error!
2839	2839	10002839	20002839	L1_FLIPPER Axis EMG status!
2840	2840	10002840	20002840	L1_FLIPPER Axis step out error!

2841	2841	10002841	20002841	L1_FLIPPER Axis over temp error!
2842	2842	10002842	20002842	L1_FLIPPER Axis motor connect error!
2843	2843	10002843	20002843	L1_FLIPPER Axis encoder connect error!
2844	2844	10002844	20002844	L1_FLIPPER Axis system halt error!
2845	2845	10002845	20002845	L1_FLIPPER Axis rom device error!
2846	2846	10002846	20002846	L1_FLIPPER Axis rom device error!
2847	2847	10002847	20002847	L1_FLIPPER Axis error! (all)
2848	2848	10002848	20002848	L1_FLIPPER Axis (+)limit error!
2849	2849	10002849	20002849	L1_FLIPPER Axis (-)limit error!
2850	2850	10002850	20002850	L1_FLIPPER Axis servo not ready!
2851	2851	10002851	20002851	L1_FLIP_ELELVATOR Axis S/W (-)limit error!
2852	2852	10002852	20002852	L1_FLIP_ELELVATOR Axis S/W (+)limit error!
2853	2853	10002853	20002853	L1_FLIP_ELELVATOR Axis motion Parameter (-)Limit error!
2854	2854	10002854	20002854	L1_FLIP_ELELVATOR Axis motion Parameter (+)Limit error!
2855	2855	10002855	20002855	L1_FLIP_ELELVATOR Axis position overflow error!
2856	2856	10002856	20002856	L1_FLIP_ELELVATOR Axis over current error!
2857	2857	10002857	20002857	L1_FLIP_ELELVATOR Axis over speed error!
2858	2858	10002858	20002858	L1_FLIP_ELELVATOR Axis position tracking error!
2859	2859	10002859	20002859	L1_FLIP_ELELVATOR Axis over load error!
2860	2860	10002860	20002860	L1_FLIP_ELELVATOR Axis over heat error!
2861	2861	10002861	20002861	L1_FLIP_ELELVATOR Axis back EMF error!
2862	2862	10002862	20002862	L1_FLIP_ELELVATOR Axis motor power error!
2863	2863	10002863	20002863	L1_FLIP_ELELVATOR Axis inposition error!
2864	2864	10002864	20002864	L1_FLIP_ELELVATOR Axis EMG status!
2865	2865	10002865	20002865	L1_FLIP_ELELVATOR Axis step out error!
2866	2866	10002866	20002866	L1_FLIP_ELELVATOR Axis over temp error!
2867	2867	10002867	20002867	L1_FLIP_ELELVATOR Axis motor connect error!
2868	2868	10002868	20002868	L1_FLIP_ELELVATOR Axis encoder connect error!
2869	2869	10002869	20002869	L1_FLIP_ELELVATOR Axis system halt error!
2870	2870	10002870	20002870	L1_FLIP_ELELVATOR Axis rom device error!
2871	2871	10002871	20002871	L1_FLIP_ELELVATOR Axis rom device error!
2872	2872	10002872	20002872	L1_FLIP_ELELVATOR Axis error! (all)
2873	2873	10002873	20002873	L1_FLIP_ELELVATOR Axis (+)limit error!
2874	2874	10002874	20002874	L1_FLIP_ELELVATOR Axis (-)limit error!
2875	2875	10002875	20002875	L1_FLIP_ELELVATOR Axis servo not ready!
2876	2876	10002876	20002876	RAIL2_WIDTH Axis S/W (-)limit error!
2877	2877	10002877	20002877	RAIL2_WIDTH Axis S/W (+)limit error!
2878	2878	10002878	20002878	RAIL2_WIDTH Axis motion Parameter (-)Limit error!

2879	2879	10002879	20002879	RAIL2_WIDTH Axis motion Parameter (+)Limit error!
2880	2880	10002880	20002880	RAIL2_WIDTH Axis position overflow error!
2881	2881	10002881	20002881	RAIL2_WIDTH Axis over current error!
2882	2882	10002882	20002882	RAIL2_WIDTH Axis over speed error!
2883	2883	10002883	20002883	RAIL2_WIDTH Axis position tracking error!
2884	2884	10002884	20002884	RAIL2_WIDTH Axis over load error!
2885	2885	10002885	20002885	RAIL2_WIDTH Axis over heat error!
2886	2886	10002886	20002886	RAIL2_WIDTH Axis back EMF error!
2887	2887	10002887	20002887	RAIL2_WIDTH Axis motor power error!
2888	2888	10002888	20002888	RAIL2_WIDTH Axis inposition error!
2889	2889	10002889	20002889	RAIL2_WIDTH Axis EMG status!
2890	2890	10002890	20002890	RAIL2_WIDTH Axis step out error!
2891	2891	10002891	20002891	RAIL2_WIDTH Axis over temp error!
2892	2892	10002892	20002892	RAIL2_WIDTH Axis motor connect error!
2893	2893	10002893	20002893	RAIL2_WIDTH Axis encoder connect error!
2894	2894	10002894	20002894	RAIL2_WIDTH Axis system halt error!
2895	2895	10002895	20002895	RAIL2_WIDTH Axis rom device error!
2896	2896	10002896	20002896	RAIL2_WIDTH Axis rom device error!
2897	2897	10002897	20002897	RAIL2_WIDTH Axis error! (all)
2898	2898	10002898	20002898	RAIL2_WIDTH Axis (+)limit error!
2899	2899	10002899	20002899	RAIL2_WIDTH Axis (-)limit error!
2900	2900	10002900	20002900	RAIL2_WIDTH Axis servo not ready!
2901	2901	10002901	20002901	L2_FLIPPER Axis S/W (-)limit error!
2902	2902	10002902	20002902	L2_FLIPPER Axis S/W (+)limit error!
2903	2903	10002903	20002903	L2_FLIPPER Axis motion Parameter (-)Limit error!
2904	2904	10002904	20002904	L2_FLIPPER Axis motion Parameter (+)Limit error!
2905	2905	10002905	20002905	L2_FLIPPER Axis position overflow error!
2906	2906	10002906	20002906	L2_FLIPPER Axis over current error!
2907	2907	10002907	20002907	L2_FLIPPER Axis over speed error!
2908	2908	10002908	20002908	L2_FLIPPER Axis position tracking error!
2909	2909	10002909	20002909	L2_FLIPPER Axis over load error!
2910	2910	10002910	20002910	L2_FLIPPER Axis over heat error!
2911	2911	10002911	20002911	L2_FLIPPER Axis back EMF error!
2912	2912	10002912	20002912	L2_FLIPPER Axis motor power error!
2913	2913	10002913	20002913	L2_FLIPPER Axis inposition error!
2914	2914	10002914	20002914	L2_FLIPPER Axis EMG status!
2915	2915	10002915	20002915	L2_FLIPPER Axis step out error!
2916	2916	10002916	20002916	L2_FLIPPER Axis over temp error!

2917	2917	10002917	20002917	L2_FLIPPER Axis motor connect error!
2918	2918	10002918	20002918	L2_FLIPPER Axis encoder connect error!
2919	2919	10002919	20002919	L2_FLIPPER Axis system halt error!
2920	2920	10002920	20002920	L2_FLIPPER Axis rom device error!
2921	2921	10002921	20002921	L2_FLIPPER Axis rom device error!
2922	2922	10002922	20002922	L2_FLIPPER Axis error! (all)
2923	2923	10002923	20002923	L2_FLIPPER Axis (+)limit error!
2924	2924	10002924	20002924	L2_FLIPPER Axis (-)limit error!
2925	2925	10002925	20002925	L2_FLIPPER Axis servo not ready!
2926	2926	10002926	20002926	L2_FLIP_ELELVATOR Axis S/W (-)limit error!
2927	2927	10002927	20002927	L2_FLIP_ELELVATOR Axis S/W (+)limit error!
2928	2928	10002928	20002928	L2_FLIP_ELELVATOR Axis motion Parameter (-)Limit error!
2929	2929	10002929	20002929	L2_FLIP_ELELVATOR Axis motion Parameter (+)Limit error!
2930	2930	10002930	20002930	L2_FLIP_ELELVATOR Axis position overflow error!
2931	2931	10002931	20002931	L2_FLIP_ELELVATOR Axis over current error!
2932	2932	10002932	20002932	L2_FLIP_ELELVATOR Axis over speed error!
2933	2933	10002933	20002933	L2_FLIP_ELELVATOR Axis position tracking error!
2934	2934	10002934	20002934	L2_FLIP_ELELVATOR Axis over load error!
2935	2935	10002935	20002935	L2_FLIP_ELELVATOR Axis over heat error!
2936	2936	10002936	20002936	L2_FLIP_ELELVATOR Axis back EMF error!
2937	2937	10002937	20002937	L2_FLIP_ELELVATOR Axis motor power error!
2938	2938	10002938	20002938	L2_FLIP_ELELVATOR Axis inposition error!
2939	2939	10002939	20002939	L2_FLIP_ELELVATOR Axis EMG status!
2940	2940	10002940	20002940	L2_FLIP_ELELVATOR Axis step out error!
2941	2941	10002941	20002941	L2_FLIP_ELELVATOR Axis over temp error!
2942	2942	10002942	20002942	L2_FLIP_ELELVATOR Axis motor connect error!
2943	2943	10002943	20002943	L2_FLIP_ELELVATOR Axis encoder connect error!
2944	2944	10002944	20002944	L2_FLIP_ELELVATOR Axis system halt error!
2945	2945	10002945	20002945	L2_FLIP_ELELVATOR Axis rom device error!
2946	2946	10002946	20002946	L2_FLIP_ELELVATOR Axis rom device error!
2947	2947	10002947	20002947	L2_FLIP_ELELVATOR Axis error! (all)
2948	2948	10002948	20002948	L2_FLIP_ELELVATOR Axis (+)limit error!
2949	2949	10002949	20002949	L2_FLIP_ELELVATOR Axis (-)limit error!
2950	2950	10002950	20002950	L2_FLIP_ELELVATOR Axis servo not ready!
2951	2951	10002951	20002951	RAIL3_WIDTH Axis S/W (-)limit error!
2952	2952	10002952	20002952	RAIL3_WIDTH Axis S/W (+)limit error!
2953	2953	10002953	20002953	RAIL3_WIDTH Axis motion Parameter (-)Limit error!
2954	2954	10002954	20002954	RAIL3_WIDTH Axis motion Parameter (+)Limit error!

2955	2955	10002955	20002955	RAIL3_WIDTH Axis position overflow error!
2956	2956	10002956	20002956	RAIL3_WIDTH Axis over current error!
2957	2957	10002957	20002957	RAIL3_WIDTH Axis over speed error!
2958	2958	10002958	20002958	RAIL3_WIDTH Axis position tracking error!
2959	2959	10002959	20002959	RAIL3_WIDTH Axis over load error!
2960	2960	10002960	20002960	RAIL3_WIDTH Axis over heat error!
2961	2961	10002961	20002961	RAIL3_WIDTH Axis back EMF error!
2962	2962	10002962	20002962	RAIL3_WIDTH Axis motor power error!
2963	2963	10002963	20002963	RAIL3_WIDTH Axis inposition error!
2964	2964	10002964	20002964	RAIL3_WIDTH Axis EMG status!
2965	2965	10002965	20002965	RAIL3_WIDTH Axis step out error!
2966	2966	10002966	20002966	RAIL3_WIDTH Axis over temp error!
2967	2967	10002967	20002967	RAIL3_WIDTH Axis motor connect error!
2968	2968	10002968	20002968	RAIL3_WIDTH Axis encoder connect error!
2969	2969	10002969	20002969	RAIL3_WIDTH Axis system halt error!
2970	2970	10002970	20002970	RAIL3_WIDTH Axis rom device error!
2971	2971	10002971	20002971	RAIL3_WIDTH Axis rom device error!
2972	2972	10002972	20002972	RAIL3_WIDTH Axis error! (all)
2973	2973	10002973	20002973	RAIL3_WIDTH Axis (+)limit error!
2974	2974	10002974	20002974	RAIL3_WIDTH Axis (-)limit error!
2975	2975	10002975	20002975	RAIL3_WIDTH Axis servo not ready!

8.6 Collection Events

ID	Name	Description	Associated DVs
0	ControlStateLocal	Control State Machine switched to local (operator) control.	
1	ControlStateRemote	Control State Machine switched to remote (host) control.	
2	EquipmentOffline	Control State Machine switched to the offline state.	
3	MaterialReceived	Material arrived to a port on the equipment.	LaneID(61004)
4	MaterialRemoved	Material departed from a port on the equipment.	LaneID(61004)
5	MessageRecognition	Machine operator recognized a terminal service message from the host. Triggered when the client application calls RecognizeTerminalMsg().	
6	OperatorCommandIssued	Machine operator issued a control command.	OperatorCommand(6)

7	PPChange	A process program (recipe) has been created changed or deleted.	PPChangeName(3), PPChangeStatus(4)
8	PPSelected	A new process program (recipe) has been accepted. Either the host or machine operator has selected the recipe.	
9	ProcessingCompleted	Normal exit of the EXECUTING state as part of the Processing State Machine.	
10	ProcessingStarted	Normal entry of the EXECUTING state as part of the Processing State Machine.	
11	ProcessingStateChange	The state of the Processing State Machine has changed.	
12	ProcessingStopped	A previously requested STOP command has been performed.	
13	SpoolTransmitFailure	A communication failure has occurred while in the TRANSMIT SPOOL state.	
14	SpoolingActivated	Spooling State Machine has entered the SPOOL ACTIVE state.	
15	SpoolingDeactivated	Spooling State Machine has entered the SPOOL INACTIVE state.	
16	ECChange	An equipment constant value was changed locally by the operator.	ECID(7), ECChangeName(2052), ECChangeValue(2053), ECPreviousValue(2060)
17	TraceTimestampOutOfTolerance	Trace time tolerance set by TraceTimestampTolerance is exceeded	
18	HostCommandAccepted	Another host remote command was performed.	HostCmdName(10), HostCmdHostID(11)
19	HostECChange	Another host changed an equipment constant(EC) value.	HostECID(9), HostECHostID(8)
20	HostPPChange	Another host created deleted or overwrote a Process Program.	HostPPChangeName(12), HostPPChangeStatus(13), HostPPChangeHostID(14)
21	PPVerificationFailed	Process program (recipe) verification failed.	
70001	BarcodeReadingCompleted	BoardBarcodeReadingComplete	EventTime(60001), LaneID(61004), PCBID(60004), ProgramName(60006)
70002	InspectionStarted	InspectionStarted	EventTime(60001), LaneID(61004), PCBID(60004), ProgramName(60006)
70003	InspectionCompleted	InspectionCompleted	EventTime(60001), LaneID(61004), PCBID(60004), ProgramName(60006), PCBSide(60005), PCBResult(60002), PanelResult(60003), RAWDATA(60007)
70004	ReviewStarted	ReviewStarted	EventTime(60001), LaneID(61004), PCBID(60004), ProgramName(60006)

				EventTime(60001), LaneID(61004), PCBID(60004), ProgramName(60006), PCBSide(60005), PCBResult(60002), PanelResult(60003), RAWDATA(60007)
70005	ReviewCompleted	ReviewCompleted		

8.7   Remote Commands

Name	Arguments		Processing States	Description
	Name (ASCII)	Value (ASCII)		
CSTOP			PROCESSING	Command to cycle stop Machine.
PP-SELECT	PPID LANE	<ppid> <land>	IDLE	This command instructs the equipment to make the requested process program(s) available in the execution area. The process programs (PPID) are specified via the command parameter list. A status variable contains the PPID of the process program(s) currently selected. The "LANE" argument is optional. Add "LANE" argument when you need change the recipe at lane2 (0:Lane1, 1:Lane2)
START			READY IDLE	This command is available to the host when a process program has been selected and the equipment is in the "ready" processing state. The START command instructs the equipment to initiate processing.
STOP			READY PROCESSING	Command to stop Machine

8.8   GEM Graphical User Interface

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8.8.1   Display

Name	Description
Communication State	
Control State	
Incoming Terminal Services	
Processing State	
Current Recipe	
Spooling	
Alarms	

8.8.2   Controls

Name	Description
Enable/Disable Communication	
Local/Remote Control	
On-line/Off-line Control	
Spool Enable/Disable	
View Incoming Terminal Services	
Acknowledge Terminal Services	
Send Terminal Services	
Recipe Upload	
Recipe Download	

8.9   GEM Interface Installation

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