

SEMI E5-0600

SEMI EQUIPMENT COMMUNICATIONS STANDARD 2 MESSAGE CONTENT (SECS-II)

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NOTICE: The user's attention is called to the possibility that some implementations of this standard, particularly those related to the use of Stream 4, may involve the use of inventions covered by U.S. patents 4,884,674 and 5,216,613, and by other patents issued or pending, held by Texas Instruments Incorporated. By publication of this standard, SEMI takes no position respecting either the applicability or the validity of these or other patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

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1 Introduction

1.1 *Intent* — The SEMI Equipment Communications Standard Part 2 (SECS-II) defines the details of the interpretation of messages exchanged between intelligent equipment and a host. This specification has been developed in cooperation with the Japan Electronic Industry Development Association Committee 12 on Equipment Communications.

1.1.1 It is the intent of this standard to be fully compatible with SEMI Equipment Communications Standard E4 (SECS-I). It is also the intent to allow for compatibility with alternative message transfer protocols. The details of the message transfer protocol requirements are contained in Section 3.

1.1.2 It is the intent of this standard to define messages to such a level of detail that some consistent host software may be constructed with only minimal knowledge of individual equipment. The equipment, in turn, may be constructed with only minimal knowledge of the host.

1.1.3 The messages defined in the standard support the most typical activities required for IC manufacturing. The standard also provides for the definition of equipment-specific messages to support those activities not covered by the standard messages. While certain activities can be handled by common software in the host, it is expected that equipment-specific host software may be required to support the full capabilities of the equipment.

1.2 *Overview* — SECS-II gives form and meaning to messages exchanged between equipment and host using a message transfer protocol, such as SECS-I.

1.2.1 SECS-II defines the method of conveying information between equipment and host in the form of messages. These messages are organized into categories of activities, called streams, which contain specific messages, called functions. A request for information and the corresponding data transmission is an example of such an activity.

1.2.2 SECS-II defines the structure of messages into entities called items and lists of items. This structure allows for a self-describing data format to guarantee proper interpretation of the message.

1.2.3 The interchange of messages is governed by a set of rules for handling messages called the transaction protocol. The transaction protocol places some minimum requirements on any SECS-II implementation.

1.3 *Application* — SECS-II applies to equipment and hosts used in the manufacturing of semiconductor devices. Examples of the activities supported by the standard are: transfer of control programs, material movement information, measurement data, summarized test data, and alarms.

1.3.1 The minimum compliance to this standard involves meeting the few constraints outlined in Section 5. It is expected that a given piece of equipment will require only a subset of the functions described in this standard. The number of functions and the selection of functions will depend upon the equipment capabilities and requirements. For each piece of equipment, the exact format for each function provided must be documented according to the form outlined in Section 7.

1.3.2 It is assumed that the equipment will define the messages used in a particular implementation of SECS-II. It is assumed the host will support equipment implementation.

1.4 *Applicable Documents*

1.4.1 *ANSI*¹

¹ ANSI, 1430 Broadway, New York, NY 10018

X3.4-1977 — Code for Information Interchange (ASCII)

1.4.2 IEEE²

754 — Standard for Binary Floating Point Arithmetic

1.4.3 SEMI Standards³

SEMI E4 — SEMI Equipment Communications Standard 1 Message Transfer (SECS-I)

SEMI E6 — Facilities Interface Specifications Guideline and Format

1.4.4 The Japan Electronic Industry Development Association (JEIDA) has requested that the SECS-II standard incorporate support for the JIS-8 codes for data exchange. This code would allow support for katakana characters in Japanese implementations of SECS-II.

JIS 8-bit Coded Character Set (JIS-6226) for information Interchange, Japanese Industrial Standards.

NOTE 1: As listed or revised, all documents cited shall be the latest publications of adopted standards.

1.5 This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 Selected Definitions

2.1 The following brief definitions refer to sections providing further information.

2.1.1 *block* — a physical division of a message used by the message transfer protocol (see Section 3.3).

2.1.2 *conversation* — a sequence of related messages (see Section 5.4).

2.1.3 *conversation timeout* — an indication that a conversation has not completed properly (see Section 5.4.1).

2.1.4 *device ID* — a number between 0 and 32767 used in identifying the particular piece of equipment communicating with a host (see Section 3.4.1).

2.1.5 *equipment* — the intelligent system which communicates with a host.

2.1.6 *function* — a specific message for a specific activity within a stream (see Section 4.2).

2.1.7 *host* — the intelligent system which communicates with the equipment.

2.1.8 *interpreter* — the system that interprets a primary message and generates a reply when requested (see Section 3.2).

2.1.9 *item* — a data element within a message (see Section 6.2).

2.1.10 *item format* — a code used to identify the data type of an item (see Section 6.2).

2.1.11 *list* — a group of items (see Section 6.3).

2.1.12 *message* — a complete unit of communication (see Section 3.2).

2.1.13 *message header* — information about the message passed by the message transfer protocol (see Section 3.4).

2.1.14 *multi-block message* — a message sent in more than one block by the message transfer protocol (see Section 3.3.2).

2.1.15 *originator* — the creator of a primary message (see Section 3.2).

2.1.16 *packet* — a physical division of a message used by the message transfer protocol (see Section 3.3).

2.1.17 *primary message* — an odd numbered message. Also, the first message of a transaction (see Sections 3.2 and 4.2).

2.1.18 *reply* — the particular secondary message corresponding to a primary message (see Sections 3.2 and 4.2).

2.1.19 *secondary message* — an even-numbered message. Also the second message of a transaction (see Sections 3.2 and 4.2).

2.1.20 *single-block message* — a message sent in one block by the message transfer protocol (see Section 3.3.1).

2.1.21 *stream* — a category of messages (see Section 4.1).

2.1.22 *transaction* — a primary message and its associated secondary message, if any (see Section 5.2).

2.1.23 *transaction timeout* — an indication from the message transfer protocol that a transaction has not completed properly (see Section 3.5).

3 The Message Transfer Protocol

3.1 *Intent* — SECS-II is fully compatible with the message transfer protocol defined by SECS-I. It is the intent of this standard to allow for compatibility with alternative message transfer protocols. The purpose of this section is to define the requirements of the interaction between an application using SECS-II and the message transfer protocol. The methods used to

² IEEE Service Center, 445 Hoe Lane, Piscataway, NJ 08854

³ SEMI, 805 E. Middlefield Road, Mountain View, CA 94043

implement these requirements are not covered as a part of this standard. The terms used in this standard are those used by SECS-I. Equivalent terms may be different for other message transfer protocols.

3.2 Messages — The message transfer protocol is used to send messages between equipment and host. The message transfer protocol must be capable of sending a primary message, indicating whether a reply is requested; and, if a reply is requested, it must be capable of associating the corresponding secondary message or reply message with the original primary message. The term originator will refer to the creator of the original primary message. The term interpreter will refer to the entity that interprets the primary message at its destination and generates a reply when requested.

3.3 Blocking Requirements — The message transfer protocol must support the following SECS-II message blocking requirements.

3.3.1 Single-Block Messages — SECS-II requires that certain messages be sent in a single block or single packet by the message transfer protocol. Those messages defined in this standard as single-block SECS-II messages must be sent in a single-block or packet. The method used by the application software to tell the message transfer protocol that a particular message must be sent as a single block is not covered as part of this standard. For compatibility with SECS-I, the maximum length allowed for a single-block SECS-II message is 244 bytes. The minimum requirement for the message transfer protocol is to be able to send single-block SECS-II messages.

3.3.2 Multi-Block Messages — For compatibility with SECS-I, SECS-II messages that are longer than 244 bytes are referred to as multi-block messages. Also, certain SECS-II messages are allowed to be multi-block messages even if they otherwise meet the single-block length requirements. Certain older implementations may impose application-specific requirements on block sizes for certain incoming messages. Beginning with the 1988 revision of the standard, new applications may not impose application-specific requirements on incoming block sizes. Applications implemented before 1988 may impose such requirements.

3.4 Message Header — The message transfer protocol must provide the following information, called the message header, with every message. Only the content of the message header is defined by this standard. The exact format of the message header passed between the application and the message transfer protocol is not covered as part of this standard.

NOTE 2: In SECS-I, this information is contained in the 10-byte header of each block of a message.

3.4.1 Device ID — The message transfer protocol must be capable of identifying the device ID (0-32767) which indicates the source or destination of a message.

3.4.2 Stream and Function — The message transfer protocol must be capable of identifying to SECS-II a minimum 15-bit message identification code. In SECS-II, messages are identified by a stream code (0-127, 7 bits) and a function code (0-255, 8 bits). Each combination of stream and function represents a distinct message identification.

3.4.3 Reply Requested — The message transfer protocol must be capable of identifying whether a reply is requested to a primary message.

3.5 Transaction Timeout — It is presumed that the message transfer protocol will notify SECS-II in the event of failure to receive an expected reply message within a specified transaction timeout period.

NOTE 3: In SECS-I, a transaction timeout occurs if either the reply timeout (T3) is exceeded before the first block of a reply message is received or if the inter-block timeout (T4) is exceeded before an expected block of a multi-block message is received.

3.6 Multiple Open Transactions — This standard allows, but does not require, the support of more than one concurrent open transaction.

4 Streams and Functions

4.1 Streams — A stream is a category of messages intended to support similar or related activities.

4.2 Functions — A function is a specific message for a specific activity within a stream. All the functions used in SECS-II will follow a numbering convention corresponding to primary and secondary message pairs. All primary messages will be given an odd-numbered function code. The reply message function code is determined by adding one to the primary message function code. The even-numbered function following a primary message which requests no reply is reserved and is not to be used. Function code 0 is reserved in all streams for aborting transactions as described in Section 7.4.

4.3 Stream and Function Allocation — Some of the stream and function code combinations are reserved for this standard, while others are available for user definition. The stream and function codes reserved for this standard are as follows:

In Stream 0, Functions 0-255.

In Streams 1-63, Functions 0-63.

In Streams 64-127, Function 0.

The stream and function codes available for user definition are as follows:

In Streams 1-63, Functions 64-255.

In Streams 64-127, Functions 1-255.

4.3.1 The stream and function code assignment can also be represented by the diagram shown in Figure 1.

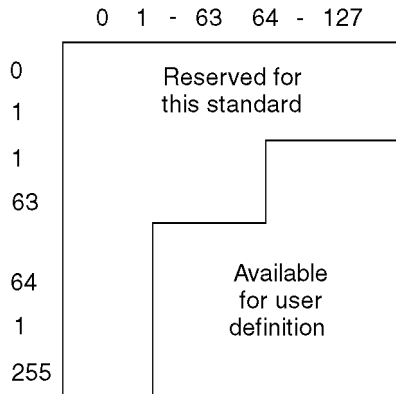


Figure 1
Stream and Function Allocation

4.3.2 The reserved codes assigned by this standard are listed in Section 7. It is recognized that there will be user needs beyond the specific definitions given in this standard. In these situations, the streams and functions reserved for user definition should be used subject to the guidelines for minimum compliance outlined in Section 5.

5 Transaction and Conversation Protocols

5.1 Intent — For an implementation to be in compliance with SECS-II, it must meet the minimum transaction requirements outlined in this section. The conversation protocols serve to further define the use and interaction between transactions.

5.2 Transaction Definition — A transaction forms the basis for all information exchanges in SECS-II. A transaction consists of either a primary message for which no reply is requested, or a primary message which requests a reply together with its corresponding secondary message. Secondary messages cannot request a reply.

5.3 Transaction Level Requirements — The following are the requirements to comply with the SECS-II protocol at the transaction level:

1. Respond to S1F1 with S1F2 as described in Section 7.5.

2. For any received message that cannot be processed by the equipment, send the appropriate error message on Stream 9. As described in Section 7.13, S9-F1, F3, F5, F7, or F11 are possible.
3. Format any other supported messages according to Section 7.
4. Upon detection of a transaction timeout at the equipment, send S9F9 to the host.
5. Upon receipt of function 0 as a reply to a primary message, terminate the related transaction. No error message should be sent to the host by the equipment.

5.4 Conversation Protocols — A conversation is a series of one or more related transactions used to complete a specific task. A conversation should include all transactions necessary to accomplish the task and leave both the originator and interpreter free of resource commitments at its conclusion.

5.4.1 Conversation Timeout — A conversation timeout is used to indicate that a conversation has not completed properly. A conversation timeout is application-dependent, and the methods used for detecting conversation timeouts are not covered as part of this standard. A conversation timeout will terminate further action on the conversation, and will allow for the clearing of any committed resources. Upon detection of a conversation timeout at the equipment, S9F13 should be sent to the host.

5.4.2 Types of Conversations — There are seven types of conversations which characterize all information exchanges in SECS-II:

1. A primary message with no reply is the simplest conversation. This message must be a single-block SECS-II message. The originator must assume that the interpreter responds to the message. This conversation is used where the originator can do nothing if the message is rejected.
2. If the interpreter has data that the originator wants, the data are requested with a primary message and the data returned to the originator as a reply message. It is assumed that the originator requesting the data is prepared to receive the amount of data returned. This is the request/data conversation.
3. If the originator wishes to send data in a single-block SECS-II message to the interpreter, then the originator sends the data and expects an acknowledgment from the interpreter. This is the send/acknowledge conversation.
4. If the originator has a multi-block SECS-II message to send for a particular exchange, then the originator must receive permission from the interpreter prior to

sending the data. The first transaction requests permission to send, and the interpreter either grants or denies permission. If permission is granted, the originator sends the data and the interpreter replies appropriately. This is the inquire/grant/send/acknowledge conversation. Between the inquire and the send, the interpreter may commit some resources in preparation for the data. Consequently, a conversation timeout may be set by the interpreter at a time dependent upon the application, at which time the interpreter will free its resources and send an S9,F13 error message to the originator. Note that under the definition of S9,F13 in this standard, only the equipment should generate an error message to the host under these conditions.

5. There is a conversation related to the transfer of unformatted data sets between equipment and host. This conversation is described in detail in Stream 13. (See Section 7.17)
6. There is a conversation related to the handling of material between equipment. This conversation is described in detail in Stream 4. (See Section 7.8)
7. The originator may request information from the interpreter which requires some time to obtain (e.g., operator input is required). The first transaction requests the information and the interpreter responds in one of three ways: 1) the information is returned, 2) the interpreter indicates that the information cannot or will not be obtained, or 3) the interpreter indicates that the information will be obtained and returned in a subsequent transaction, as specified for this conversation. For case number 3, the interpreter will initiate the subsequent transaction when the information is available.

Case 3 is the request/acknowledge/send/acknowledge transaction.

The originator of the request/acknowledge/send/acknowledge conversation may commit some resources in anticipation of the send/acknowledge transaction. Consequently, a conversation timeout may be set by the originator at a time dependent on the application. On timeout, the originator will free its resources and restart the conversation with the 'request', or send an S9,F13 error message. Note that under the definition of S9,F13 in this standard, only the equipment should generate an error message to the host under these conditions.

5.4.3 The key words, request, data, send, acknowledge, inquire, and grant are used in the function names as an aid to understanding the relationship between the messages and the conversation. Single message transactions do not use these words.

6 Data Structures

6.1 *Intent* — All information transmitted according to this standard will be formatted using two data structures, items and lists. These data structures define the logical divisions of the message, as distinct from the physical divisions of the message transfer protocol. They are intended to provide a self-describing internal structure to messages passed between equipment and host.

6.2 *Item* — An item is an information packet which has a length and format defined by the first 2, 3, or 4 bytes of the item. These first bytes are called the item header (IH). The item header consists of the format byte and the length byte(s) as shown in Figure 2. Bits one and two of the item header tell how many of the following bytes refer to the length of the item. This feature allows for long items without requiring the byte overhead for shorter items. The item length refers to the number of bytes following the item header, called the item body (IB), which is the actual data of the item. The item length refers only to the item body not including the item header, so the actual number of bytes in the message for one item is the item length plus 2, 3, or 4 bytes for the item header. All bytes in the item body are in the format specified in the format byte.

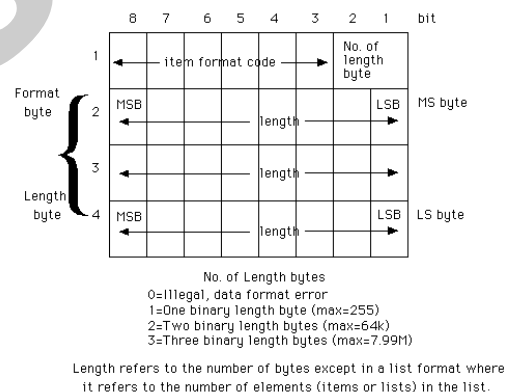


Figure 2
Item and List Header

6.2.1 A zero-length in the format byte is illegal and produces an error. A zero-length in the item length bytes has a special meaning as defined in the detailed message definitions.

6.2.2 Bits 3 through 8 of the format byte of the item header define the format of the data which follows. Of the 64 possible formats, 15 are defined as shown in Table 1. Format code 0 is called a list and is defined in E5 6.3. Format code 22 (octal) is called a localized string and is defined in SEMI E5 Section 6.4. The remaining 14 item formats define unspecified binary,

code 10 (octal); Boolean, code 11 (octal); ASCII character strings, code 20 (octal); JIS-8 character strings, code 21 (octal) signed integer, codes 30, 31, 32, 34 (octal); floating point, codes 40, 44 (octal); and unsigned integer, codes 50, 51, 52, 54 (octal). These formats are used for groups of data which have the same representation in order to save repeated item headers. Signed integers will be two's complement values. Floating point numbers will conform to the IEEE standard 754. Boolean values will be byte quantities, with zero being equivalent to false, and non-zero being equivalent to true.

6.3 List — A list is an ordered set of elements, where an element can be either an item (6.2) or a list. The list header (LH) has the same form as an item header with format type 0. However, the length bytes refer to the number of elements in the list rather than to the number of bytes. The list structure allows grouping items of related information which may have different formats into a useful structure.

6.3.1 A zero-length in the format byte is illegal and produces an error. A zero-length in the list length bytes has a special meaning, which is defined in the detailed message definitions.

Format Code	Meaning
Binary	The data after the heading
Bit 876543 Octal	has the following form
000000 00	LIST (length in elements)
001000 10	Binary
001001 11	Boolean
010000 20	ASCII ¹
010001 21	JIS-8
010010 22	2-byte character ^{2, 4}
011000 30	8-byte integer (signed) ²
011001 31	1-byte integer (signed)
011010 32	2-byte integer (signed) ²
011100 34	4-byte integer (signed) ²
100000 40	8-byte floating point ³
100100 44	4-byte floating point ³
101000 50	8-byte integer (unsigned) ²
101001 51	1-byte integer (unsigned)
101010 52	2-byte integer (unsigned) ²
101100 54	4-byte integer (unsigned) ²

¹Non-printing characters are equipment-specific.

²Most significant byte sent first.

³IEEE 754. The byte containing the sign bit is sent first.

⁴The code for Multi-byte character must be specified in the data in the first 2 bytes of the TEXT item.

NOTE: Changes in integer format codes may conflict with earlier implementations.

6.4 Localized Character String Items — A localized character string is an item which is used for repre-

senting a string of multi-byte character. Because there are many different encoding schemes and the information could be in any one of a number of languages, these characteristics must also be included in the item. Thus for localized character strings which use item format code 22 (octal), there is an additional localized string header (LSH).

This localized string header follows the item header and precedes the string. The localized string header is part of the item data, thus the length of the header (2 bytes) is included in the length in the item header. The length of the localized string itself is the number of bytes that it occupies, regardless of the number of characters that represents the string. The localized string header followed by the string together comprise the localized string item. For example, a 2 byte localized string (which may represent a single character), because of the 2 byte length of the localized string header, will have a 4 byte length in the item header.

The LSH is a 16 bit number which specifies the encoding method used for the string. Defined values for the encoding are as follows:

Encoding Code (Decimal)	Encoding Scheme	Notes
0	none	reserved
1	ISO 10646 UCS-2	Unicode 2.0
2	UTF-8	Transformation of ISO 10646 UCS-2
3	ISO 646-1991	ASCII, 7-bit
4	ISO 8859-1	ISO Latin-1, Western Europe
5	ISO 8859-11 (proposed)	Thai
6	TIS 620	Thai (will be supported by ISO 8859-11)
7	IS 13194 (1991)	ISCII
8	Shift JIS	
9	Japanese EUC-JP	
10	Korean EUC-KR	
11	Simplified Chinese GB	
12	Simplified Chinese EUC-CN	
13	Traditional Chinese Big5	
14	Traditional Chinese EUC-TW	

Encoding Codes from 15 to 32767 are reserved for future expansion. Encoding codes from 32768 to 65535 are available for custom purposes.

6.5 *Example Data Structures* — The data structures for different types of items are illustrated in the following examples:

- a. An item contains one binary code 10101010.

```

bit
87654321

00100001  Item, binary, 1 length byte
00000001  1 byte long
10101010  data byte
  
```

- b. An item contains three ASCII characters ABC.

```

01000001  Item ASCII, 1 length byte
00000011  Three bytes long
01000001  ASCII A
01000010  ASCII B
01000011  ASCII C
  
```

- c. An item contains three binary numbers in 2-byte signed integer form.

```

01101001 Item, 2-byte integers
00000110 6 bytes total (6/2=3 integers)
xxxxxxx  MSByte number x
xxxxxxx  LSByte number x
yyyyyyyy MSByte number y
yyyyyyyy LSByte number y
zzzzzzzz MSByte number z
zzzzzzzz LSByte number z
  
```

- d. An item contains one 4-byte IEEE floating point number.

```

10010001  Item, 4-byte floating point
00000100  4 bytes (4/4=1 number)
fffffff  Floating point number
fffffff  in IEEE 754
fffffff
  
```

- e. A message is sent from device 66 telling the host that the temperature at point T1 has exceeded a preset process limit. The message ID is stream 5, function 1, and the data consists of a list of three items. The first item is a code for the alarm set and the alarm category code. The second item is the equipment-specific alarm number for this alarm (e.g., 17). The third item is a string of text giving a brief description of the alarm (e.g., "T1 HIGH.") No reply is requested. The complete message including the header is as follows:

```

10000000    R=1 (to the host)
00101110    Device Code=66
00000101    Stream 5, W=0
00000001    Function 1
10000000    E=1
00000001    Block 1
00000000
00000000    System bytes=0
00000000
00000000
00000001    List
00000011    3 Elements
00100001    Binary Item next byte length
00000001    1 byte long
00000100    Alarm set, category 4
01100101    Item, 1-byte integer, next byte length
00000001    1 byte long
00010001    Alarm 17
01000001    Item, ASCII, next byte length
00000111    7 characters
01010100    ASCII T
00110001    ASCII 1
00100000    ASCII space
01001000    ASCII H
01001001    ASCII I
01000111    ASCII G
01001000    ASCII H

```

The entire message contains 17 bytes of data, 1-byte length (not shown), 10 bytes of header, and 2 bytes checksum (not shown) for a total of 30 bytes. At 9600 baud transmission, the message would be sent in 31 milliseconds.

6.6 Data Item Dictionary — This section defines the data items used in the standard SECS-II messages described in Section 7, Message Detail.

Name: A unique mnemonic name for this data item. This name is used in message definitions.

Format: The allowable item format codes which can be used for this standard data item. Item format codes are shown in octal, as described in Table 1, Item Format Codes. The notation "3()" indicates any of the signed integer formats (30, 31, 32, 34). The notation "4()" indicates any of the floating point formats (40, 44). The notation "5()" indicates any of the unsigned integer formats (50, 51, 52, 54). The notation "0" indicates that a list with user-defined structure may be used. Where more than one format is shown, a given implementation can use any of the formats specified.

Description: A description of the data item, with the meanings of specific values.

Where Used: The standard messages in which this data item appears.

ABS

Format: 10

Any binary string

Where Used: S2F25, F26

ACDS

Format: 32, 52

After Command Codes

Vector of all command codes which defined command must succeed within the same block.

Where Used: S7F22

ACKA

Format: 11

Indicates success of a request:

TRUE is successful else FALSE

Where Used: S5F14, F15, F18; S16F2, F4, F6, F12, F14, F16, F18, F24, F26, F28; S17F4, F8, F14

ACKC3

Format: 10

Acknowledge code, 1 byte

0 = Accepted
>0 = Error, not accepted
1-63 Reserved

Where Used; S3F6, F8, F10

ACKC5

Format: 10

Acknowledge code, 1 byte

0 = Accepted
>0 = Error, not accepted
1-63 Reserved

Where Used; S5F2, F4

ACKC6

Format: 10

Acknowledge code, 1 byte

0 = Accepted
>0 = Error, not accepted
1-63 Reserved

Where Used; S6F2, F4, F10, F12, F14

ACKC7

Format: 10

Acknowledge code, 1 byte

- 0 = Accepted
- 1 = Permission not granted
- 2 = Length error
- 3 = Matrix overflow
- 4 = PPID not found
- 5 = Mode unsupported
- >5 = Other error
- 6-63 Reserved

Where Used: S7F4, F12, F14, F16, F18, F24, F32

ACKC7A

Format: 31, 51

Acknowledge Code, 1 byte

- 0 = Accepted
- 1 = MDLN is inconsistent
- 2 = SOFTREV is inconsistent
- 3 = Invalid CCODE
- 4 = Invalid PPARM value
- 5 = Other error (described by ERRW7)
- 6-63 Reserved

Where Used: S7F27

ACKC10

Format: 10

Acknowledge Code, 1 byte

- 0 = Accepted for display
- 1 = Message will not be displayed
- 2 = Terminal not available
- 3-63 Reserved

Where Used: S10F2, F4, F6, F10

ACKC13

Format: 10

Return code for secondary messages 1 byte.

- 0 = O.K.
- 1 = ERROR: Try Later
- 2 = ERROR: Unknown Data Set name
- 3 = ERROR: Illegal Checkpoint value
- 4 = ERROR: Too many open Data Sets
- 5 = ERROR: Data set open too many times
- 6 = ERROR: No open Data Set
- 7 = ERROR: Cannot continue
- 8 = ERROR: End of Data
- 9 = ERROR: Handle in Use
- >10 = ERROR: Pending Transaction
- 11-127 Reserved

Where Used: S13F2, F4, F6, F8

AGENT

Format: 20

Where Used: S15F11, 12, 21, 22, 25

ALCD

Format: 10

Alarm code byte

bit 8 = 1 means alarm set
bit 8 = 0 means alarm cleared
bit 7-1 is alarm category
0 = Not used
1 = Personal safety
2 = Equipment safety
3 = Parameter control warning
4 = Parameter control error
5 = Irrecoverable error
6 = Equipment status warning
7 = Attention flags
8 = Data integrity
>8 = Other categories
9-63 Reserved

Where Used: S5F1, F6

ALED

Format: 10

Alarm enable/disable code, 1 byte

bit 8 = 1 means enable alarm
bit 8 = 0 means disable alarm

Where Used: S5F3

ALID

Format: 3(), 5()

Alarm identification

Where Used: S5F1, F3, F5, F6

ALTX

Format: 20

Alarm text limited to 40 characters

Where Used: S5F1, F6

ATTRDATA

Format: 0, 10, 20, 3(), 4(), 5()

Contains a specific attribute value for a specific object.

Where Used: S1F20; S13F14, F16; S14F1, F2, F3, F4, F9, F10, F11, F12, F13, F14, F15, F16, F17, F18

ATTRID

Format: 20, 5()

Identifier for an attribute for a specific type of object.

Where Used: S1F19; S13F14, F16; S14F1, F2, F3, F4, F8, F9, F10, F11, F12, F13, F14, F15, F16, F17, F18; S18F1, F3

ATTRRELN

Format: 51

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.

Where Used: S14F1

BCDS

Format: 32, 52

Before Command Codes

Vector of all command codes which defined command must precede within the same block.

Where Used: S7F22

BCEQU

Format: 20, 51

Bin code equivalents

Array of all codes that are to be processed. Must be the same format as BINLT and NULBC. Zero length indicates all codes be sent.

Where Used: S12F3, F4

BINLT

Format: 20, 51

The Bin List

Is an array of bin values. Format must be the same as used in NULBC and BCEQU.

Where Used: S12F7, F9, F11, F14, F16, F18

BLKDEF

Format: 31, 51

Block Definition

Blocks define the range for before/after code checking (specified by BCDS, IBCDS, NBCDS, ACDS, IACDS, and NACDS). BLKDEF specifies whether the command being defined starts a block (+1), terminates a block (-1), or is within the body of a block (0). All other values are invalid. The outermost block of a process program is implicit, and is bounded by the first and last command of the process program. Before/after checks for a particular command are performed with all other commands in the same block and at the same nesting level. For the purpose of before/after checking, a set of commands making up a block is considered to be a single body command of its containing block. This command has the before/after restrictions of the start block command which begins the block.

Where Used: S7F22

BPD

Format: 10

Boot program Data

Where Used: S8F2

BYTMAX

Format: 3(), 5()

Byte Maximum

Maximum length of process program. A value of zero indicates no limit. Negative values are invalid.

Where Used: S7F22

CAACK

Format: 51

Carrier Action Acknowledge Code. One 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.
- 6-63 reserved.

Where Used: S3F18, F20, F22, F24, F26

CARRIERACTION

Format: 20

Specifies the action requested for a carrier.

Where Used: S3F17

CARRIERID Format: 20
The identifier of a carrier.

CARRIERSPEC Format: 20
The object specifier for a carrier. Conforms to OBJSPEC.
Where Used: S3F17

CATTRDATA Format: 0, 10, 20, 3(), 4(), 5()
The value of a carrier attribute.
Where Used: S3F17

CATTRID Format: 20
The name of a carrier attribute.
Where Used: S3F17

CCODE Format: 32, 52
Command Code
Each command code corresponds to a unique process operation the machine is capable of performing.
Where Used: S7F22, F23, F26, F31

CEED Format: 11
Collection event or trace enable/disable code, 1 byte
FALSE = Disable
TRUE = Enable
Where Used: S2F37; S17F5

CEID Format: 20, 3(), 5()
Collected event ID
Where Used: S2F35, F37; S6F3, F8, F9, F11, F13, F15, F17; S17F5, F9, F10, F11, F12

CEPACK

Format: 0, 51

Command Enhanced Parameter Acknowledge. If a specific value of CPNAME is defined to have a CEPVAL that is a LIST, then CEPACK shall have the same structure as the corresponding list format of CEPVAL as used in S2,F49. Otherwise CEPACK will be a 1 byte integer. Enumerated:

- 0 = No error
- 1 = Parameter name (CPNAME) does not exist
- 2 = Illegal value specified for CEPVAL
- 3 = Illegal format specified for CEPVAL
- 4 = Parameter name (CPNAME) not valid as used
- 5-63 Reserved

Where Used: S2F50

CEPVAL

Format: 0, 10, 11, 20, 21, 3(), 4(), 5()

Command Enhanced Parameter Value. A specific application of CEPVAL shall always be identified with a specific value of CPNAME. A CEPVAL has the following forms: a single (non-list) value (e.g., CPVAL), a list of single items of identical format and type, or a list of items of the form.

- L, 2
 - 1. CPNAME
 - 2. CEPVAL

Where Used: S2F49

CKPNT

Format: 54

Checkpoint as defined by the sending system

Where Used: S13F3, F6

CMDA

Format: 31, 51

Command acknowledge code

- 0 = Completed or done
- 1 = Command does not exist
- 2 = Cannot perform now
- >2 = Other equipment-specific error
- 3-63 Reserved

Where Used: S2F22, F28

CMDMAX

Format: 3(), 5()

Command Maximum

Maximum number of commands to be allowed in a process program. A value of zero indicates no limit. Negative values are invalid.

Where Used: S7F22

CNAME

Format: 20

Command Name = 16 characters

Text string unique among other CNAMEs in PCD which describes the processing done by the equipment for the corresponding CCODE.

Where Used: S7F22

COLCT

Format: 5()

Column count in die increments

Where Used: S12F1, F4

COLHDR

Format: 20

Text description of contents of TBLELT. 1 - 20 characters

Where Used: S13F13, F16

COMMACK

Format: 10

Establish Communications Acknowledge Code, 1 byte

0 = Accepted
1 = Denied, Try Again
2-63 Reserved

Where Used: S1F14

CPACK

Format: 10

Command Parameter Acknowledge Code, 1 byte

1 = Parameter Name (CPNAME) does not exist
2 = Illegal Value specified for CPVAL
3 = Illegal Format specified for CPVAL
>3 = Other equipment-specific error
4-63 Reserved

Where Used: S2F42

CPNAME

Format: 20, 3(), 5()

Command Parameter Name

Where Used: S2F41, F42, F49, F50; S4F21, F29; S16F5, F27

CPVAL

Format: 10, 11, 20, 21, 3(), 5()

Command Parameter Value

Where Used: S2F41, F49; S4F21, F29; S16F5, F27; S18F13

CSAACK

Format: 10

Equipment Acknowledgement code, 1 byte

- 0 = Everything correct
- 1 = Busy
- 2 = Invalid SPID
- 3 = Invalid data
- >3 = Equipment-specific error
- 4-63 Reserved

Where Used: S2F8

CTLJOBCMD

Format: 51

Control Job command codes are assigned as follows:

- 1 - CJStart
- 2 - CJPause
- 3 - CJResume
- 4 - CJCancel
- 5 - CJDeselect
- 6 - CJStop
- 7 - CJAbort
- 8 - CJHOQ

Where used: S16F27

CTLJOBID

Format: 20

Identifier for Control Job. Conforms to OBJID.

Where used: S16F27

DATA

Format: 20

A vector or string of unformatted data.

Where Used: S18F6,F7

DATAID

Format: 20, 3(), 5()

Data ID

Where Used: S2F33, F35, F39, F45, F49; S3F15, F17; S4F19, F25; S6F3, F5, F7, F8, F9, F11, F13, F16, F18, F27; S13F11, F13, F15; S15F27, F29, F33, F35, F37, F39, F41, F43, F45, F47; S16F1, F3, F5, F11, F13; S17F1, F5, F9

DATALength

Format: 3(), 5()

Total bytes to be sent

Where Used: S2F39; S3F15; S4F25; S6F5; S13F11; S16F1, F11; S18F5, F7

DATASEG Format: 20

Used to identify the data requested.

Where Used: S18F5,F7

DATASRC Format: 20

Object type for Data Source Objects

Where Used: S14F1, F3, F6, F7, F8; S17F1

DATLC Format: 51

Data location

Location of invalid data, represented in bytes, measured from the start of the message in question, excluding all header bytes.

Where Used: S12F19

DRACK Format: 10

Define Report Acknowledge Code, 1 byte

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

Where Used: S2F34

DSID Format: 20, 3(), 5()

Data set ID

Where Used: S6F3, F8, F9

DSNAME Format: 20

The name of the Data Set

The minimum length is zero. The maximum is 50 characters.

Where Used: S13F1, F2, F3, F4

DSPER

Format: 20

Data sample period. DSPER has two allowable formats

Format 1: hhmmss, 6 bytes
Format 2: hhmmsscc, 8 bytes

Where "hh" is hours, "mm" is minutes, "ss" is seconds' and "cc" is centiseconds.

Equipment shall either (1) support only Format 1, or (2) support both Format 1 and Format 2. Equipment shall document which formats it accepts.

Equipment which supports Format 2 need not necessarily support a minimum DSPER of 1 centisecond, nor a trace resolution of 1 centisecond, but equipment suppliers shall document its trace performance limits.

Where Used: S2F23

DUTMS

Format: 20

Die Units of Measure

Use units description per SEMI E5 Section 9.

Where Used: S12F1, F4

DVNAME

Format: 3(), 20, 5()

Data value name

Where Used: S6F3, F8

DVVAL

Format: 0, 10, 11, 20, 21, 3(), 4(), 5()

Data value

Where Used: S6F3, F8, F9

EAC

Format: 10

Equipment acknowledge code, 1 byte

0 = Acknowledge
1 = Denied. At least one constant does not exist
2 = Denied. Busy
3 = Denied. At least one constant out of range
>3 = Other equipment-specific error
4-63 Reserved

Where Used: S2F16

ECDEF

Format: 10, 11, 20, 21, 3(), 4(), 5()

Equipment constant default value

Where Used: S2F30

ECID Format: 3(), 20, 5()
 Equipment Constant ID
 Where Used: S2F13, F15, F29, F30

ECMAX Format: 10, 11, 20, 21, 3(), 4(), 5()
 Equipment constant maximum value
 Where Used: S2F30

ECMIN Format: 10, 11, 20, 21, 3(), 4(), 5()
 Equipment constant minimum value
 Where Used: S2F30

ECNAME Format: 20
 Equipment constant name
 Where Used: S2F30

ECV Format: 10, 11, 20, 21, 3(), 4(), 5()
 Equipment Constant Value
 Where Used: S2F14, F15

EDID Format: 10, 20, 3(), 5()
 Expected data Identification
 Three possible responses.

MEXP	EDID	EDID
S02F03,	<SPID>	A[6]
S03F13,	<PTN>	B[1]
S07F03,	<PPID>	A[80], B[80]

Where Used: S9F13

EMID Format: 10, 20
 Equivalent material ID (16 bytes maximum)
 Where Used: S3F9

EPD Format: 10
 Executive program data
 Where Used: S8F4



EQNAME

Format: 20

A unique ASCII equipment identifier assigned by the factory to the equipment. Limited to a maximum of 80 characters.

Where Used: S4F29

ERACK

Format: 10

Enable/Disable Event Report

Acknowledge Code, 1 byte

0 = Accepted
1 = Denied. At least one CEID does not exist
>1 = Other Errors
2-63 Reserved

Where Used: S2F38

SUPERSEDED

ERRCODE

Format: 5()

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 too 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
48-63	=	Reserved

Where Used: S1F20; S3F16; S4F20, F22, F23, F33, F35; S5F14, F15, F18; S13F14, F16; S14F2, F4, F6, F8, F10, F12, F14, F16, F18; S15F28, F18, F20, F22, F24, F26, F30, F32, F34, F36, F38, F40, F42, F44, F48; S16F12, F14, F16, F18, F24, F26, F28; S17F2, F4, F6, F8, F10, F12, F14

ERRTEXT

Format: 20

Text string describing the error noted in the corresponding ERRCODE. Limited to 80 characters maximum.

Where Used: S1F20; S3F16; F18, F20, F22, F24, F26, S4F20, F22, F23, F33, F35; S5F14, F15, F18; S13F14, F16; S14F2, F4, F6, F8, F10, F12, F14, F16, F18; S15F28, F30, F32, F34, F36, F38, F40, F42, F44, F48; S16F12, F14, F16, F18, F24, F26, F28; S17F4, F8, F14

ERRW7

Format: 20

Text string describing error found in process program.

Where Used: S7F27

EVNTSRC

Format: 20

Object type for Event Source Objects

Where Used: S17F5, F9, F10, F11, F12

EXID

Format: 20

Unique identifier for the exception. Maximum length of 20 characters.

Where Used: S5F9, F11, F13, F14, F15, F17, F18

EXMESSAGE

Format: 20

Text which describes the nature of the exception.

Where Used: S5F9, F11

EXRECVRA

Format: 20

Text which specifies a recovery action for an exception. Maximum length of 40 bytes.

Where Used: S5F9, F13

EXTYPE

Format: 20

Text which identifies the type of an exception. It is usually a single word of text.

"ALARM"

"ERROR"

Where Used: S5F9, F11; S14F1, F2, F8

FCNID

Format: 51

Function Identification

Where Used: S2F43, F44

FFROT

Format: 52

Film Frame Rotation

In degrees from the bottom CW. (Bottom equals zero degrees.) Zero length indicates not used.

Where Used: S12F1, F3

FILDAT

Format: 10, 20

Data from the Data Set

The maximum length is the RECLEN from Open Data Set Data.

Where Used: S13F6

FNLOC

Format: 52

Flat/Notch Location

In degrees from the bottom CW. (Bottom equals zero degrees.) Zero length indicates not used.

Where Used: S12F1, F3, F4

FRMLEN

Format: 3(), 5()

Formatted Process Program Length

If greater than zero, indicates PPID is available as a formatted process program and its length in bytes. If zero, the PPID is not available as a formatted program. Negative values are invalid.

Where Used: S7F34

GRANT

Format: 10

Grant code, 1 byte

0 = Permission Granted
1 = Busy, Try Again
2 = No Space Available
3 = Duplicate DATAID
>3 = Equipment Specific Error Code
4-63 Reserved

Where Used: S2F2, F40; S3F16; S4F26; S13F12; S16F2, F12

GRANT6

Format: 10

Permission to send, 1 byte

0 = Permission granted
1 = Busy, try again
2 = Not interested
>2 = Other errors
3-63 Reserved

Where Used: S6F6

GRNT1

Format: 10

Grant code, 1 byte

- 0 = Positive response, transfer ok
- 1 = Busy, try again
- 2 = No space
- 3 = Map too large
- 4 = Duplicate ID
- 5 = Material ID not found
- 6 = Unknown map format
- >6 = Error
- 7-63 Reserved

Where Used: S12F6

HANDLE

Format: 3(), 5()

Logical unit or channel

Where Used: S13F3, F4, F5, F6, F7, F8

HCACK

Format: 10

Host Command Parameter Acknowledge Code, 1 byte

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

Where Used: S2F42, F50

HOACK

Format: 11

Conveys whether the corresponding handoff activity succeeded (=True) or failed (=False)

Where Used: S4F31, F33

HOCANCELACK

Format: 51

Tells whether the cancel ready message was accepted or rejected

- 0 = Cancel Ready Accepted
- 1 = Atomic Transfer Unknown
- 2 = Cancel Ready Rejected - Handoff Begun

Where Used: S4F13

HOCMDNAME

Format: 20

Identifier for the handoff command to be executed

Where Used: S4F31

HOHALTACK

Format: 51

Tells whether the halt command was accepted or rejected

0 = Halt Accepted
1 = Atomic Transfer Unknown
2-63 Reserved

Where Used: S4F41

IACDS

Format: 32, 52

Immediately After Command Codes

Vector of all command codes which defined command must immediately succeed within the same block.

Where Used: S7F22

IBCDS

Format: 32, 52

Immediately Before Command Codes

Vector of all command codes which defined command must immediately precede within the same block.

Where Used: S7F22

IDTYP

Format: 10

Id type

0 = Wafer ID
1 = Wafer Cassette ID
2 = Film Frame ID
>2 = Error
3-63 Reserved

Where Used: S12F1, F3, F4, F5, F7, F9, F11, F13, F14, F15, F16, F17, F18

LENGTH

Format: 3(), 5()

Length of the service program or process program in bytes

Where Used: S2F1; S7F1, F29

LIMITACK

Format: 10

Acknowledgment code for variable limit attribute set, 1 byte

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

Where Used: S2F46

LIMITID

Format: 10

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, 1 byte.

Where Used: S2F45, F46, F48

LIMITMAX

Format: 11, 20, 3(), 4(), 5()

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.

Where Used: S2F48

LIMITMIN

Format: 11, 20, 3(), 4(), 5()

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.

Where Used: S2F48

LINKID

Format: 54

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.

Where Used: S6F25; S15F22, F30

LLIM

Format: 3(), 4(), 5()

Lower limit for numeric value

Where Used: S7F22

LOC

Format: 10

Machine material location code, 1 byte

Where Used: S2F27; S3F2

LOWERDB

Format: 11, 20, 3(), 4(), 5()

A variable limit attribute which defines the lower boundary of the deadband 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.

Where Used: S2F45, F48

LRACK

Format: 10

Link Report Acknowledge Code, 1 byte

- 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

Where Used: S2F36

LVACK

Format: 10

Variable limit definition acknowledge code, 1 byte. Defines the error with the limit attributes for the referenceVID.

- 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

Where Used: S2F46

MAPER

Format: 10

Map Error

- 0 = ID not found
- 1 = Invalid Data
- 2 = Format Error
- >2 = Invalid error
- 3-63 Reserved

Where Used: S12F19

MAPFT

Format: 10

Map data format type

```
0   =   Row format
1   =   Array format
2   =   Coordinate format
>2  =   Error
3-63 Reserved
```

Where Used: S12F3, F5

MCINDEX

Format: 5()

Identifier used to link a handoff command message with its eventual completion message. Corresponding messages carry the same value for this data item.

Where Used: S4F31, F33

MDACK

Format: 10

Map data acknowledge

```
0   =   Map received
1   =   Format error
2   =   No ID match
3   =   Abort/discard map
>3  =   Error
4-63 Reserved
```

Where Used: S12F8, F10, F12

MDLN

Format: 20

Equipment Model Type, 6 bytes max

Same data as returned by S1,F2

Where Used: S1F2, F13, F14; S7F22, F23, F26, F31

MEXP

Format: 20

Message expected in the form SxxFyy where x is stream and y is function.

Where Used: S9F13

MF

Format: 10, 20

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 Section 9

Where Used: S3F2, F4, F5, F7 S16F11, F13, F15

MHEAD

Format: 10

SECS message block header associated with message block in error

Where Used: S9F1, F3, F5, F7, F11

MID

Format: 10, 20

Material ID

16 Characters maximum

Where Used: S2F27; S3F2, F4, F7, F9, F12, F13; S4F1, F3, F5, F7, F9, F11, F13, F15, F17; S7F7, F8, F10, F11, F13, F35, F36; S12F1, F3, F4, F5, F7, F9, F11, F13, F14, F15, F16, F17, F18; S16F11, F13, F15; S18F10, F11

MIDAC

Format: 10

Material ID Acknowledge Code, 1 byte

- 0 = Accepted
- 1 = Invalid port number
- 2 = Material is not present at identified port
- >2 = Error
- 3-63 Reserved

Where Used: S3F14

MIDRA

Format: 10

Material ID Acknowledge Code, 1 byte

- 0 = Acknowledge, MID follows
- 1 = Acknowledge, will not send MID
- 2 = Acknowledge, will send MID later in S3F13
- 3-63 Reserved

Where Used: S3F12

MLCL

Format: 5()

Message length

Defined by message size in (bytes)

Where Used: S12F4, F5

MMODE

Format: 10

Matrix mode select, 1 byte

- 1 = Host source mode
Use S7F7 and F8 to define the process program to be used.
- 2 = Local source mode
Use the matrix defined by S7F9, F10, F11 and F13 to define the process program to be used. The equipment will initialize to local source mode at power up. The equipment will default to local source mode from host source mode in the event of loss of communication with the host.
- 3 = Host immediate mode
Use the current process program for all material unless changed by S7F1-F4. The timing of the mode change is equipment-specific

Where Used: S7F15

NACDS

Format: 32, 52

Not After Command Codes

Vector of all command codes which defined command may not succeed within the same block.

Where Used: S7F22

NBCDS

Format: 32, 52

Not Before Command Codes

Vector of all command codes which defined command may not precede within the same block.

Where Used: S7F22

NULBC

Format: 20, 51

Null bin code value

This value is the bin code value that is used for no die at a location.
(For X/Y coordinate format the ASCII value is a value with "n" length. For other map formats, ASCII is a single byte per bin with "n" length per item; thus, the total number of bins is the length, i.e., length "n"=10 for ASCII format is 10 single byte bin codes.) The format used must be the same as the one used for BINLT and BCEQU. Zero length indicates not used.

Where Used: S12F1, F3, F4

OBJACK

Format: 51

Acknowledge code:

```
0   =   Successful completion of requested data
1   =   Error
>1  Reserved
```

Where Used: S14F2, F4, F6, F8, F10, F12, F14, F16, F18

OBJCMD

Format: 51

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

Format: 20, 50

Identifier for an object

Where Used: S1F19; S14F1, F2, F3, F4

OBJSPEC

Format: 20

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.

Where Used: S2F49; S13F11, F13, F15; S14F1, F3, F5, F7, F9, F10, F11, F13, F15, F16, F17; S15F43, F47

OBJTOKEN

Format: 54

Token used for authorization.

Where Used: S14F14, F15; S15F37, F39, F41, F43

OBJTYPE Format: 20, 5()

Identifier for a group or class of objects. All objects of the same type must have the same set of attributes available.

Where Used: S1F19; S14F1, F3, F6, F7, F8

OFLACK Format: 10

Acknowledge code for OFF-LINE request.

0 = OFF-LINE Acknowledge
1-63 Reserved

Where Used: S1F16

ONLACK Format: 10

Acknowledge code for ON-LINE request.

0 = ON-LINE Accepted
1 = ON-LINE Not Allowed
2 = Equipment Already ON-LINE
3-63 Reserved

Where Used: S1F18

OPID Format: 5()

Operation ID. A unique integer generated by the requestor of an operation, used where multiple completion confirmations may occur.

Where Used: S6F25; S15F21, F29, F30, F37, F41, F44, F46

ORLOC Format: 10

Origin Location

implicit value of (0,0)
0 = Center die of wafer
(Determined by:
$$\frac{\text{row or column count} + 1}{2}$$

truncated)
1 = Upper right
2 = Upper left
3 = Lower left
4 = Lower right
>4 = Error
5-63 Reserved
Zero length indicates not available

Where Used: S12F1, F3, F4

PARAMNAME

Format: 20

The name of a parameter in a request.

Where Used: S3F21,F23

PARAMVAL

Format: 1, 10, 11, 20, 3(), 4(), 5()

The value of the parameter named in PARAMNAME. Values that are lists are restricted to lists of single items of the same format type.

Where Used: S3F21,F23

PDFLT

Format: 11, 20, 3(), 4(), 5()

Parameter Default Value

Specifies default value and data type of parameter. If no defaults are provided, item data length will be zero. For numeric or Boolean data, the default item may be a multi-varied vector if the parameter itself can be a vector.

If RQPAR is false:

Position of data in a default item is significant. When obtaining a default value to be used in the Nth position of a vector parameter, the value is obtained from the Nth position of the default item. If the default item has L entries, no default value will be provided for the L+1,...,PMAx parameter entries.

If RQPAR is true:

The length of the default vector (L) specifies the minimum number of entries which must be entered for the parameter. If > PMAx, only PMAx entries are required.

Where Used: S7F22

PFCD

Format: 10

Predefined form code, 1 byte

Where Used: S6F9

PGRPACTION

Format: 20

The action to be performed on a port group.

Where Used: S3F23

PMAX

Format: 3(), 5()

Parameter Count Maximum

Maximum amount of data to be accepted by the host for this parameter. When a conflict arises between value of PMAX and length of PDFLT, PMAX takes precedence.

For numeric and Boolean parameters:

PMAX < 0 invalid

PMAX = 0 specifies there is no upper bound

PMAX = 1 specified a single value is expected

PMAX > 1 specifies a vector of values is expected with a maximum of PMAX entries

For string parameters:

PMAX < 0 invalid

PMAX = 0 specifies there is no upper bound

PMAX > 0 maximum length of parameter string

Where Used: S7F22

PNAME

Format: 20

Parameter Name ≤ 16 characters

Text string identifying the parameter value expected by its parent process command.

Where Used: S7F22

PORTACTION

Format: 20

The action to be performed on a port.

Where Used: S3F25

PORTGRPNAME

Format: 20

The identifier of a group of ports.

Where Used: S3F21, F23

PPARM

Format: 11, 20, 3(), 4(), 5()

Process Parameter

Numeric or Boolean SECS data item, single or multiple value, or text string which provides information required to complete the process command to which the parameter refers.

Where Used: S7F23, F26, F31

PPBODY

Format: 10, 20, 3(), 5()

Process program body

The process program describes to the equipment, in its own language, the actions to be taken in processing the material it receives.

Where Used: S7F3, F6, F36

PPGNT

Format: 10

Process program grant status, 1 byte

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

Where Used: S7F2, F30

PPID

Format: 10, 20

Process program ID.

Limited to a maximum of 80 bytes.
The format used in the PPID will be host-dependent. For internal use of the equipment, the PPID can be treated as a unique binary pattern. If the local equipment is not prepared to display the transmitted code, the display should be in hexadecimal form.

Where Used: S2F27; S7F1, F3, F5, F6, F8, F10, F11, F13, F17, F20, F23, F25, F26, F27, F31, F33, F34, F36; S9F13

PRAXI

Format: 10

Process axis.

0 = Rows (X-axis), top, increasing
1 = Rows (X-axis), top, decreasing
2 = Rows (X-axis), bottom, increasing
3 = Rows (X-axis), bottom, decreasing
4 = Columns (Y-axis), left, increasing
5 = Columns (Y-axis), left, decreasing
6 = Columns (Y-axis), right, increasing
7 = Columns (Y-axis), right, decreasing
>7 = Error
8-63 Reserved

Where Used: S12F1, F3

PRCMDNAME

Format: 20

Commands sent to a process job:

“START”
“STOP”
“PAUSE”
“RESUME”
“ABORT”
“CANCEL”

Where Used: S16F5

PRDCT

Format: 5()

Process Die Count

Number of die to be processed or number of die which have been processed.
(Zero length indicates not used.)

Where Used: S12F1, F4

PREVENTID

Format: 5()

Processing related event identification:

1 = Waiting for material
2 = Job state change

Where Used: S16F9

PRJOBID

Format: 20

Text string which uniquely identifies a process job.

Where Used: S16F4, F5, F6, F7, F9, F11, F12, F13, F14, F15, F16, F17, F20, F23, F25

PRJOBMILESTONE

Format: 5()

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

Where Used: S16F7

PRJOBSPACE

Format: 52

The number of process jobs that can be created.

Where used: S16F22

PRPAUSEEVENT

Format: 00

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.

Where used: S16F11, F13, F15

PTN

Format: 10, 51

Material Port number, 1 byte

Where Used: S3F17, F21, F25; S4F1, F3, F5, F7, F9, F11, F13, F15, F17; S16F13, F17, F21

QUA

Format: 10

Quantity in format, 1 byte

Where Used: S3F2, F4, F5, F7

RAC

Format: 31, 51

Reset acknowledge, 1 byte

```
0   =   Reset to be done
1   =   Reset denied
>1  =   Other errors
2-63 Reserved
```

Where Used: S2F20

RCMD

Format: 20, 31, 51

Remote command code or string

Where Used: S2F21, F41, F49

RCPATTRDATA

Format: 0, 10, 11, 20, 3(), 4(), 5()

The contents (value) of a recipe attribute.

Where Used: S6F25; S15F13, F15, F18, F27, F28, F30, F32

RCPATTRID

Format: 20

The name (identifier) of a non-identifier recipe attribute.

Where Used: S6F25; S15F13, F15, F18, F27, F28, F30, F32

RCPBODY

Format: 10, 20, 3(), 5()

Recipe body

Where Used: S15F13, F15, F18, F27, F32

RCPCLASS

Format: 20

Recipe class

Where Used: S15F11

RPCCMD

Format: 51

Indicates an action to be performed on a recipe

5	=	Delete
8	=	Unprotect
9	=	Protect
10	=	Verify
11	=	Link
12	=	Unlink
13	=	Certify
14	=	De-certify
15	=	Download
16	=	Upload
0-4, 6-7, 17-63 Reserved		

Where Used: S15F21, F22

RCPDEL

Format: 51

0	=	Delete
1	=	Deselect
>1 Reserved		

Where Used: S15F35

RCPDESCLTH

Format: 5()

The length in bytes of a recipe section.

Where Used: S15F24

RCPDESCNM

Format: 20

Identifies a type of descriptor of a recipe: "ASDesc", "BodyDesc", "GenDesc".

Where Used: S15F24

RCPDESCTIME

Format: 20

The timestamp of a recipe section, in the format "YYYYMMDDhhmmsscc".

Where Used: S15F24

RCPID

Format: 20

Recipe identifier. Formatted text conforming to the requirements of OBJSPEC.

Where Used: S15F21, F23, F28, F29, F30, F33, F35, F37, F41, F44

RCPNAME Format: 20

Recipe name

Where Used: S15F11

RCPNEWID Format: 20

The new recipe identifier assigned as the result of a copy or rename operation.

Where Used: S15F19, F41, F44

RCPOWCODE Format: 11

Indicates whether any pre-existing recipe is to be overwritten (=TRUE) or not (=FALSE) on download.

Where Used: S15F27

RCPPARNM Format: 20

The name of a recipe variable parameter. Maximum length of 40 characters.

Where Used: S15F25, F33; S16F3, F11, F13, F15, F23

RCPPARRULE Format: 20

The restrictions applied to a recipe variable parameter setting. Maximum length of 80 characters.

Where Used: S15F25

RCPPARVAL Format: 10, 11, 20, 3(), 4(), 5()

The initial setting assigned to a recipe variable parameter. Text form restricted to maximum of 80 characters.

Where Used: S15F25, F33; S16F3, F11, F13, F15, F23

RCPRENAME Format: 11

Indicates whether a recipe is to be renamed (= TRUE) or copied (= FALSE).

Where Used: S15F19

RCPSECCODE Format: 10

Indicates the sections of a recipe requested for transfer or being transferred:

- 1 = Generic attributes only
- 3 = Generic attributes and body
- 4 = All agent-specific datasets (zero or more)
- 7 = Generic attributes, body, and all agent-specific datasets
- 8 = Single agent-specific dataset (zero or one)
- 11 = Generic attributes, body, and single agent-specific datasets
- All other values reserved

Where Used: S15F15, F16, F17

RCPSECNM

Format: 20

Recipe section name: “Generic”, “Body”, or “ASDS”.

Where Used: S15F15, F18

RCPSPEC

Format: 20

Recipe specifier. The object specifier of a recipe.

Where Used: S15F1, F9, F13, F15, F17, F19, F27, F28, F31, F32, F45; S16F11, F13, F15, F23

RCPSTAT

Format: 51

The status of a managed recipe

0	=	Does not exist
8	=	Unprotected
9	=	Protected

Where Used: S15F10

RCPUPDT

Format: 11

Indicates if an existing recipe is to be updated (= True) or a new recipe is to be created (= False).

Where Used: S15F13

RCPVERS

Format: 20

Recipe version

Where Used: S15F10, F12

READLN

Format: 3(), 5()

Maximum length to read

Where Used: S13F5

RECLN

Format: 3(), 5()

Maximum length of a Discrete record

Where Used: S13F4

REFP

Format: 3()

Reference Point

Where Used: S12F1, F4

REPGSZ Format: 20, 30, 50

Reporting group size

Where Used: S2F23; S17F5

RESC Format: 31, 51

Resolution code for numeric data

- 1 = Absolute. Value may be specified to nearest increment of RESV
- 2 = Significant Digits. Value may be specified with no more significant digits than RESV allows

Where Used: S7F22

RESPEC Format: 20

Object specifier for the recipe executor

Where Used: S15F29, F33, F35

RESV Format: 30, 40, 50

Resolution value for numeric data

If RESC=1, then RESV contains smallest increment allowed for parameter

Where Used: S7F22

RIC Format: 31, 51

Reset code, 1 byte

- 0 = Not used
- 1 = Power up reset
- >1 Other reset conditions
- 2-63 Reserved

Where Used: S2F19

RMACK Format: 51

Conveys whether a requested action was successfully completed, denied, completed with errors, or will be completed with notification to the requestor.

- 0 = Successful completion
- 1 = Cannot perform action
- 2 = Completed with errors
- 3 = Action will be completed and notification sent
- 4 = No request for this action exists

Where Used: S15F4, F6, F8, F10, F12, F14, F16, F18, F20, F22, F24, F25, F26, F28, F30, F32, F34, F36, F38, F40, F42, F44, F48

RMCHGSTAT

Format: 5()

Indicates the change that occurred for an object.

0	=	No change
1	=	Created
2	=	Updated
3	=	Stored (new)
4	=	Replaced
5	=	Deleted
6	=	Copied (new object)
7	=	Renamed
8	=	Unprotected
9	=	Protected
10	=	Verified
11	=	Linked
12	=	Unlinked
13	=	Certified
14	=	De-certified
15	=	Selected
16	=	Deselected

Where Used: S15F25

RMCHGTYPE

Format: 5()

Indicates the type of change for a recipe.

0	=	No change
1	=	Create
2	=	Update
5	=	Delete
6	=	Copy (new object)
7	=	Rename
8	=	Unprotect
9	=	Product
10	=	Verify
11	=	Link
12	=	Unlink
13	=	Certify
14	=	De-certify
15	=	Change generic attribute
16	=	Change agent-specific attribute
17	=	Change both generic and agent-specific attributes

Where Used: S15F37, F41, F44, F46, F47, F48

RMDATASIZE

Format: 5()

The maximum total length, in bytes, of a multi-block message, used by the receiver to determine if the anticipated message exceeds the receiver's capacity.

Where Used: S15F1

RMGRNT

Format: 10

Grant code, used to grant or deny a request. 1 byte.

- 0 = Permission granted
- 1 = Cannot accept now, try again
- 2 = No space
- 3 = Request is on hold
- 4-64 Reserved

Where Used: S15F2, F37, F46

RMNEWNS

Format: 20

New name (identifier) assigned to a recipe namespace

Where Used: S15F5

RMNSCMD

Format: 51

Action to be performed on a recipe namespace

- 1 = Created
- 5 = Deleted
- 0, 2-4, 6-63 Reserved

Where Used: S15F3

RMNSSPEC

Format: 20

The object specifier of a recipe namespace.

Where Used: S15F3, F5, F7, F11, F21, F23, F25, F47

RMRECSPEC

Format: 20

The object specifier of a distributed recipe namespace recorder.

Where Used: S15F39, F41, F43

RMREQUESTOR

Format: 11

Set to TRUE if initiator of change request was an attached segment. Set to FALSE otherwise.

Where Used: S15F41, F44, F46

RMSEGSPEC

Format: 20

The object specifier of a distributed recipe namespace segment.

Where Used: S15F37, F39, F41, F44, F46, F47

RMSPACE

Format: 5()

The amount of storage available for at least one recipe in a recipe namespace, in bytes.

Where Used: S15F8