

SEMI D27-1000

GUIDE FOR FLAT PANEL DISPLAY EQUIPMENT COMMUNICATION INTERFACES

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1 Purpose

1.1 This is a guide for implementing equipment communication features for successful integration and automation in a flat panel display manufacturing facility.

2 Scope

2.1 This guide includes references to other SEMI standards. It also includes definitions and explanations specific to FPD equipment automation.

2.2 The scope of this guide is limited to equipment communication features that interface with factory automation systems.

2.3 This guide does not reference physical or electrical interfaces, except to the extent necessary to implement the features described. For example, a serial data cable connector could be specified to have 9 pins or 25 pins.

2.4 This guide may not be applicable to all types of FPD equipment. It only applies to those for which a direct data communication interface will be implemented between the equipment and the factory automation systems.

2.5 This guide does not address all software standards that may be applicable, but addresses a subset that is necessary for effective integration and automation.

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

3 Limitations

3.1 The other SEMI standards referred to in this document have been carefully reviewed for applicability to FPD manufacturing. However, when referring to other SEMI standards used in this specification, the reader should allow for some editorial exceptions in order to apply the specification to FPD equipment. For example, if another SEMI specification referenced here uses the term “wafer”, the reader can assume that this also applies to FPD substrates, and likewise with “silicon” and glass or plastic. These

minor differences in no way impact the interpretation or implementation of those standards in FPD manufacturing equipment and factory systems.

3.2 This guide is not an all-inclusive list of applicable standards, but is a starting point for defining requirements of these equipment automation functions, and a guideline for implementation.

4 Referenced Standards

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

4.1 SEMI Standards

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

SEMI E5 — SEMI Equipment Communications Standard 2 Message Content (SECS-II)

SEMI E23 — Specification for Cassette Transfer Parallel I/O Interface

SEMI E30 — Generic Model for Communications and Control of SEMI Equipment (GEM)

SEMI E37 — High-Speed SECS Message Services (HSMS), Generic Services

SEMI E37.1 — High-Speed SECS Message Services, Single-Session Mode (HSMS-SS)

SEMI E84 — Specification for Enhanced Carrier Handoff Parallel I/O

5 Terminology

5.1 The following define some descriptive terms that can be used to refer to systems that meet the requirements of the standards referenced herein.

5.1.1 *SECS Compliant* — This term is often used to describe systems which comply completely with both the SEMI E4 (SECS-I) and SEMI E5 (SECS-II) standards. However, it is more appropriate to identify the system as “SECS-I Compliant” and/or “SECS-II” compliant. This distinction is important because SECS-II can be implemented independently from SECS-I. The term “SECS Compliant” is ambiguous, but commonly used. It is suggested that the following terms be used

instead to describe the equipment and host communication interface.

5.1.2 SECS-I Compliant — This term is used to identify a system that complies completely with SEMI E4.

5.1.3 SECS-II Compliant — This term is used to identify a system that complies completely with SEMI E5.

5.1.4 HSMS Compliant — This term is used to describe systems which comply with SEMI E37 (HSMS) and either SEMI E37.1 (HSMS-SS) or SEMI E37.2 (HSMS-GS) or both. However, it is more appropriate to identify the system as either “HSMS-SS Compliant” or “HSMS-GS Compliant”, since they both imply compliance with SEMI E37, and the user must know exactly which of the two is supported. The term “HSMS Compliant” is ambiguous, but commonly used.

5.1.5 HSMS-SS Compliant — This term is used to identify a system that complies completely with SEMI E37 and SEMI E37.1. This protocol has been adopted for use in FPD.

5.1.6 HSMS-GS Compliant — This term is used to identify a system that complies completely with SEMI E37 and SEMI E37.2.

5.1.7 GEM — Generic Equipment Model as defined in SEMI E30.

5.1.8 GEM Compliant — This term is defined in SEMI E30.

5.1.9 Fully GEM Capable — This term is defined in SEMI E30.

5.1.10 System — Either manufacturing equipment or factory host.

6 Data Transfer

6.1 For optimum compatibility, systems supporting the automation capabilities described herein should support all requirements defined for at least one of the following SEMI protocol standards:

6.1.1 SEMI E4 (SECS-I)

6.1.2 SEMI E37.1 (HSMS-SS). Note that this requires implementation of SEMI E37.

6.1.2.1 HSMS-SS compliant interfaces are preferred for FPD manufacturing because of its performance and logistical advantages, and because it allows other protocols to operate on the same connection simultaneously.

6.1.2.2 However, SECS-I interfaces are acceptable in systems where the performance of a serial interface is sufficient. Since many off-the-shelf component

software implementations support both protocols, it is relatively easy to design systems which can be configured to support either.

7 Data Format

7.1 The system should support all minimum requirements of SEMI E5 (SECS-II). Although more modern data communication specifications are available (e.g. HTML), SECS-II has unique aspects which are valuable in microelectronics manufacturing. Also, there are many available “off-the-shelf” software packages which provide the SECS-II feature set.

7.2 Furthermore, for maximum compatibility and reliability, the implementation of any optional SEMI E5 objects (data items, variable items, messages, etc.) on the system should meet the requirements of SEMI E5. For example, if an FPD system implements the S7,F3 message, it must do so in compliance with SEMI E5 to be considered “SECS-II Compliant”. It is possible to implement “user-defined” SECS-II messages, and it is allowed by SEMI E5.

7.3 However, it is usually unnecessary to use such custom SECS-II messages. Complicated scenarios such as production sequence control, inline production, consumable management, and material handling can all be implemented using standard SECS-II messages. Many SECS-II messages are designed to be very generic and very flexible such as the Remote Command message (S2F41 or S2F49) which can contain any number of parameters of any type in any format. Many of the basic SECS-II data items such as variables can also take on any type of value in any format.

7.4 User-defined data items and messages are more difficult to integrate into FPD factory automation systems and should be avoided.

8 GEM and SEM

8.1 Generic Equipment Model (GEM)

8.1.1 Any reference to the term “GEM” (Generic Equipment Model) with respect to FPD manufacturing equipment will be construed as a reference to SEMI E30. The system provider should ensure that this term is used only for those systems which rigidly adhere to SEMI E30. End-users will make certain assumptions about the capabilities of “GEM” systems based on the requirements of SEMI E30.

8.1.2 SEMI E30 is applicable to FPD manufacturing equipment. FPD equipment suppliers may choose to implement GEM. In order for FPD equipment to be “GEM Compliant” or “Fully GEM Capable”, it must meet the requirements of SEMI E30 without exception. However, it may not be necessary to implement certain