

IEEE Trial-Use Standard for Test Equipment Description Language (TEDL)

Sponsor

IEEE SCC20 Test Equipment Description Subcommittee
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Abstract: IEEE Std 993-1990, *IEEE Trial-Use Standard for Test Equipment Description Language (TEDL)*, defines a language useful for describing Automatic Test Equipment (ATE) instrumentation and configurations, as well as Interface Test Adapters (ITA). Principally intended for testing environments using the ATLAS test language, TEDL can also be used to describe instrumentation in non-ATLAS environments.

Keywords: ARINC, ATLAS, elements, formal syntax, models, resource description, TEDL, Test Equipment Description Language, trial-use standard.

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Foreword

(This Foreword is not a part of IEEE Std 993-1990, IEEE Trial-Use Standard for Test Equipment Description Language (TEDL).)

The purpose of the Test Equipment Description Language (TEDL) is to provide a means to produce a standardized description of the equipment on which Abbreviated Test Language for All Systems (ATLAS) programs are to be implemented. This makes visible the underlying decisions affecting the actual implementation and performance of the ATLAS program, thereby improving the ability to transport ATLAS programs from one Automatic Test Equipment (ATE) to another.

The implementation of ATLAS Test Programs on ATE Systems has traditionally been a difficult process. ATE-specific constraints are imposed by the unique software implementations of each ATE systems integrator. Therefore, it has been virtually impossible to move an ATLAS program from one ATE to another with any assurance of compatible or even similar results.

The ATLAS Language was created with the goal of being “test equipment independent,” with the intentions being: (1) to be able to generate a program once, and be able to use it on a variety of test equipment; and (2) to have a usable standard industry test language.

The Unit Under Test (UUT)-orientation of the ATLAS programs has left many implementation problems open to resolution by each ATE integrator. As a result, the ATLAS language semantics have become confused. Further, these implementation decisions have typically been buried in the proprietary software of each integrator and hence, cannot be corroborated by the ATLAS program developers.

TEDL does not attempt to specify the underlying software system which supports and controls the ATE. This innovative process is left to the ATE system integrator. TEDL standardizes the human-readable language used to describe the ATE and test program adapters.

Although anyone involved in automated instrumentation may benefit from the material contained in this document, this standard is specifically intended for:

- (1) Integrators of ATE Systems using ATLAS, namely:
 - (a) IEEE Std 416, *IEEE Standard ATLAS Test Language*
 - (b) IEEE Std 716, *IEEE Standard C/ATLAS Test Language*
 - (c) ARINC Specification 626-1, *Standard ATLAS Subset for Modular Test*
- (2) ATLAS Test Program Set Developers
- (3) System Software Suppliers

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IEEE Trial-Use Standard for Test Equipment Description Language (TEDL)

1. Introduction

1.1 Purpose. The purpose of this standard is to provide a definition of a Test Equipment Description Language (TEDL).

1.2 Scope. This standard is intended to apply principally to ATE system applications using ATLAS test programs. The standard may also apply to ATE system applications using non-ATLAS test programs.

1.3 Usage. A TEDL Model is a mechanism both for describing the configuration and capability of a specific ATE system (and adapter) and for facilitating the implementation of UUT-oriented programs on the ATE system. Specifically, it describes:

- (1) The devices that are included in an ATE, and the devices included in an adapter;
- (2) How these devices are interconnected within the ATE and within the adapter;
- (3) What interfaces exist between the test station controller and the devices, as well as between the devices and an external connection.

TEDL is not intended to be a programming language. It is intended to be used to establish a data structure representing the ATE system and adapter. Some of its data elements may be dynamic, requiring processing as the state of the system changes.

The TEDL model fills the information gap between the ATLAS program and the physical instrumentation represented by P981 [P1]¹ Resource Description (RD) models.

Compliance to this standard does not remove user responsibility for system compatibility at either the application or physical communication level. Although it is the intent of this standard to simplify the system integration, the user must be familiar with the characteristics of all the system components in order to configure an optimum ATE system.

1.4 References. This standard shall be used in conjunction with the following publications:

- [1] ARINC Specification 626-1-1989, *Standard ATLAS Subset for Modular Test*.²

¹The numbers in brackets correspond to those of the references listed in Section 1.4.

²ARINC publications are available from Aeronautical Radio, Inc., 2551 Riva Road, Annapolis, MD 21401.

- [2] CCITT Volume VIII.1-1988, *Data Communication Over the Telephone Network, Series V Recommendations*.³
- [3] EIA-232-D (1987), *Interface Between Data Terminal Equipment and Data Circuit Terminating Equipment Employing Serial Binary Data Interchange*.⁴
- [4] IEEE Std 100-1988, *IEEE Standard Dictionary of Electrical and Electronics Terms*.⁵ (ANSI)
- [5] IEEE Std 416-1984, *IEEE Standard ATLAS Test Language*. (ANSI)
- [6] IEEE Std 488.1-1987, *IEEE Standard Digital Interface for Programmable Instrumentation*. (ANSI)
- [7] IEEE Std 488.2-1987, *IEEE Standard Codes, Formats, Protocols, and Common Commands for Use with ANSI/IEEE 488.1-1987*. (ANSI)
- [8] IEEE Std 716-1989, *IEEE Standard C/ATLAS Test Language*.
- [9] ISO 8802-3:1989, *Information Processing Systems Local Area Networks—Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*.⁶

When the following document is completed, approved, and published, it will become a part of the references of this standard:

- [P1] P981, Standard for Resource Description Language for Programmable Instrumentation.

1.5 Organization of the Document

Section 1 describes the purpose, the scope, and the intended application of the document.

Section 2 defines the objectives which the TEDL is intended to achieve. These objectives are established in the General Language Requirements Document for TEDL which defines these requirements.

Section 3 provides an overview of TEDL, in the form of a general description, the relationship of TEDL to other standards, and an overview of the components that comprise a TEDL model.

Section 4 defines the interface between an ATLAS program and a TEDL model.

Section 5 defines in detail the Adaptation Model, one of the components of a TEDL model.

Section 6 defines in detail the Configuration Model, one of the components of a TEDL model.

Section 7 defines in detail the Device Model, one of the components of a TEDL model.

³CCITT publications are available in the US from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018, USA.

⁴EIA publications are available from the Electronics Industries Association, Standards Sales Office, 2001 I Street, NW, Washington, DC 20006.

⁵IEEE publications are available from the Institute of Electrical and Electronics Engineers, Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331.

⁶This ISO publication is available in the US from the Institute of Electrical and Electronics Engineers, Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331.

Section 8 describes the P981 [P1] document and TEDL's interface to it.

Appendix A contains the formal syntax of TEDL.

Appendix B contains a glossary of terms used in this document, as well as descriptions of related documents.

Appendix C contains tables showing ARINC Specification 626-1-1989 [1] and IEEE Std 716-1989 [8] ATLAS elements that require TEDL modeling. The affected TEDL model (e.g., Adaptation Model, Configuration Model, or Device Model) is cross-referenced to each ATLAS element.

Appendix D contains examples of TEDL models.

1.6 Acronyms

AM	Adaptation Model
AML	Adaptation Model Language
ANSI	American National Standards Institute
ARINC	Aeronautical Radio, Incorporated
ATE	Automatic Test Equipment
ATLAS	Abbreviated Test Language for All Systems
CCITT	Consultative Committee of International Telegraph & Telephone
CM	Configuration Model
CML	Configuration Model Language
DM	Device Model
DML	Device Model Language
EIA	Electronics Industries Association
IEEE	Institute of Electrical and Electronics Engineers
RD	Resource Description (P981 [P1])
RDL	Resource Description Language (P981 [P1])
TED	Test Equipment Description
TEDL	Test Equipment Description Language
TPS	Test Program Set
UUT	Unit Under Test

1.7 Relationship to Other Documents

1.7.1 IEEE Std 416-1984, IEEE Std 716-1989, and ARINC Specification 626-1-1989. The companion standards IEEE Std 416-1984 [5], IEEE Std 716-1989 [8], and ARINC Specification 626-1-1989 [1] define the ATLAS test language which is used to write ATLAS test programs.

1.7.2 P981. TEDL uses Resource Descriptions, written in accordance with P981 [P1], as the basic physical device layer of the TEDL model. A general description of the P981 [P1] document is given in Section 8.

1.7.3 Resource Control Standards. A resource control standard defines the physical, electrical and logical aspects of the control interface between the test station controller and an instrument. The following control interfaces are supported by TEDL and are described in Appendix B:

IEEE Std 488.1-1987 [6]
 IEEE Std 488.2-1987 [7]
 EIA-232-D (1987) [3]
 CCITT Volume VIII.1-1988 [2] (V24)
 ISO 8802-3:1989 [9]

2. Objectives of TEDL

The objectives of TEDL include:

(1) TEDL provides a standard interface between ATLAS programs and test systems. A test system includes:

- (a) Individual devices, including source, sensor, load, transformation and routing;
- (b) Complete test station configurations;
- (c) UUT adapters;
- (d) ATLAS and ATE interface semantics.

(2) TEDL provides all test system information necessary to perform automatic and manual resource allocation for ATLAS programs.

(3) TEDL uses applicable information from related IEEE standards.

(4) TEDL incorporates an extensibility mechanism to enable it to cover the ATLAS language extensions which are particular to a restricted test discipline.

(5) TEDL assumes no particular control interface or ATE architecture.

(6) TEDL is modular so that a test system component can have the same TEDL description regardless of the test station configuration in which it is used.

3. Overview of TEDL

3.1 General Description. TEDL is a standard language for describing test equipment. It is intended to be used by ATE system integrators and ATLAS test program developers for describing ATE and adapters. The test equipment descriptions contain all the information necessary for the ATE system resources and the test adapter to provide the signals required by the ATLAS test program. These descriptions are intended to be both human and machine readable.

TEDL specifically targets the ATLAS language, which is a high-order language for describing test procedures. The ATLAS language is oriented to signals and events that take place at the UUT connection interface. ATLAS test programs are, therefore, independent of the ATE hardware. The ATE resources supply the necessary signals and event recognizers in accordance with the requirements of the ATLAS test program in order to satisfy the test specification for the UUT.

Each implementation of ATLAS on a particular ATE requires the existence of a software system to process the ATLAS programs and control the ATE. In order for the software system to properly carry out these functions, it must have a model of the ATE and the adaptation hardware (adapter).

The description of the ATE is typically the responsibility of the ATE system integrator. This description includes:

- (1) Modeling of the capabilities of resources and their interconnections;
- (2) Definition of the resource control interfaces (such as IEEE Std 488.1-1987 [6], IEEE Std 488.2-1987 [7] and EIA-232-D (1987) control interfaces);

The description of the adapter hardware is typically the responsibility of the ATLAS test program designer (often working with the ATE system integrator). This description includes:

- (1) A definition of all interconnections through the adapter;
- (2) A definition of all active and passive devices in the adapter. This may include one or more of the following: sensor, source, load, sink, a transformation device or switch.

3.2 TEDL Models. TEDL consists of a layered series of models that fully describe the linkage between the logical resource descriptions of the test system and the ATLAS test program. This is shown in Fig 3-1.

TEDL can be described in terms of its three component models; the Adaptation Model, the Configuration Model and the Device Model. These three layered models provide standardization and facilitate the implementation of ATLAS programs in actual hardware. In addition, TEDL refers to P981 [P1], which describes the function of resources contained in the ATE. When used in conjunction with a resource description, TEDL provides the linkage between the ATLAS test program and the ATE on which the test program is implemented. Figure 3-2 illustrates the relationship between the TEDL component models.

A requirement of each layer is to map the terms and conditions of the upper boundary of a model to the terms and conditions of the lower boundary. This mapping is necessary to interpret the meaning of high-level statements into lower level statements. The mapping is dependent on the ATE and the ATE system environment. It is developed by the ATE system integrator and distributed throughout the layers by model semantics. Model semantics provide the meaning of any ATE description requirement, and may transcend more than one layer. Model semantics are defined in Sections 5 through 7 of this document.

The TEDL model does not impose a specific architecture on the ATE system designer. However, a typical architectural model of a TEDL support system is shown in Fig 3-3.

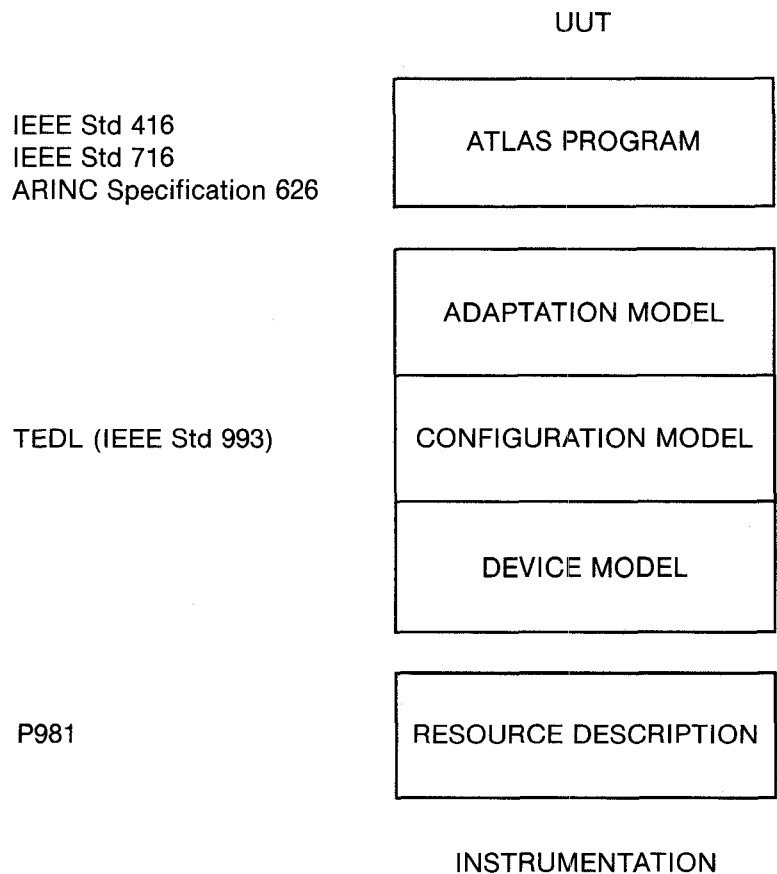


Fig 3-1
TEDL Models and Related Interfaces

3.2.1 The Adaptation Model. The Adaptation Model is a logical model for describing the inter-connection between the test station interface, adapter devices, and the UUT connections. The Adaptation Model is the layer that links the software model of the ATE configuration to the ATLAS test program. Typically, one Adaptation Model is necessary for each ATLAS program executed on an ATE system. Figure 3-4 shows the components described by an Adaptation Model. The Adaptation Model is described by the Adaptation Model Language defined in Section 5 of this document.

3.2.2 The Configuration Model. The Configuration Model is a logical model for describing the elements of an ATE system, as well as their interconnection and intercommunication in the test environment.

One Configuration Model is associated with each ATE system. Figure 3-5 shows the components described by a Configuration Model. The Configuration Model is described by the Configuration Model Language defined in Section 6 of this document.

3.2.3 The Device Model. The primary purpose of the Device Model (DM) is to translate ATLAS syntax into Resource Description Language (RDL) syntax.

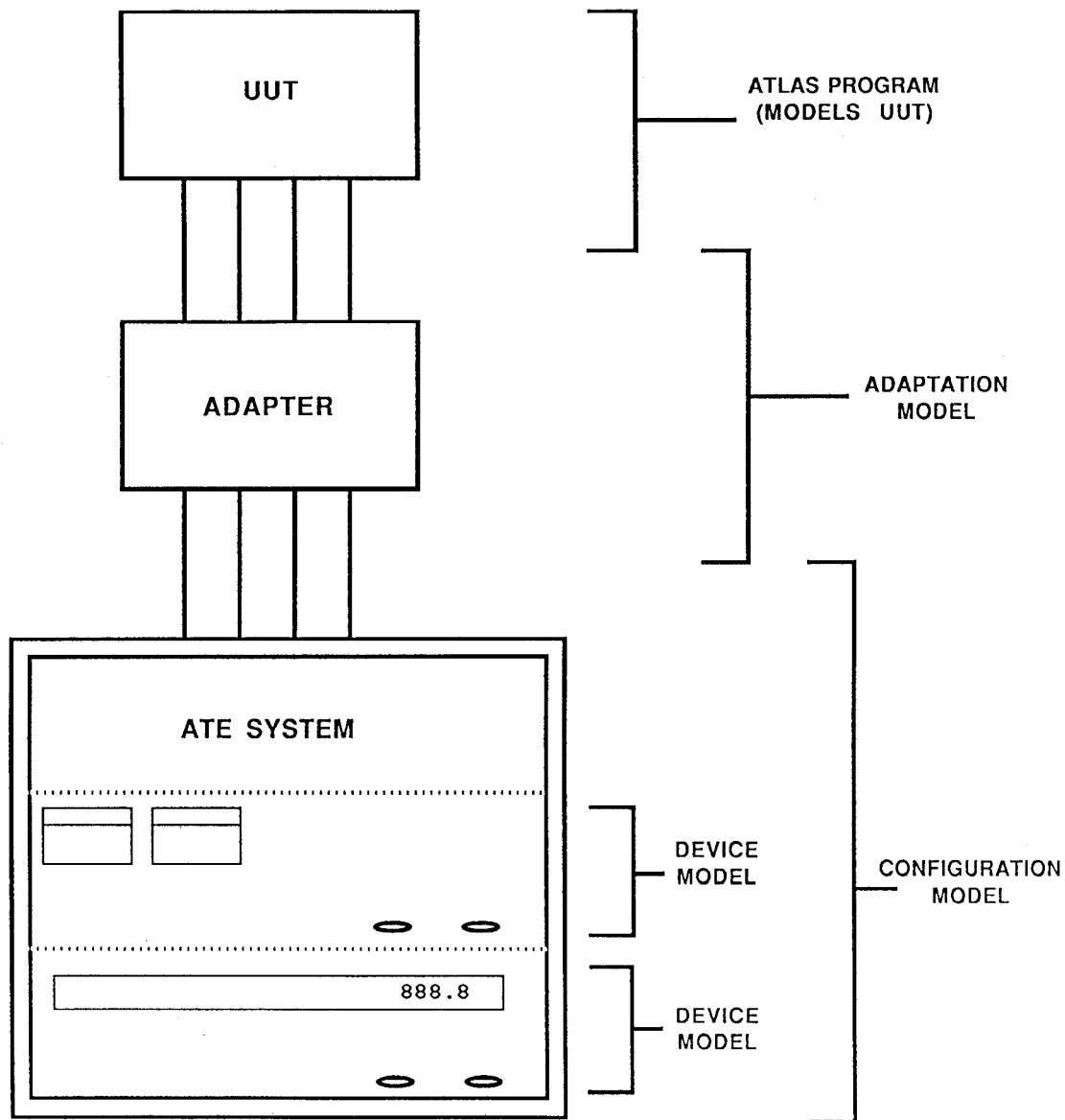


Fig 3-2
Relationship Between TEDL Component Models

Device Models are logical models that describe logical devices associated with an ATE system. A logical device may be:

- (1) A physical device (such as a voltmeter);
- (2) Part of a physical device (such as only the voltage measuring capability of a multimeter);
- (3) The combination of multiple physical devices (such as a device which synthesizes frequency modulated signals using two function generators);

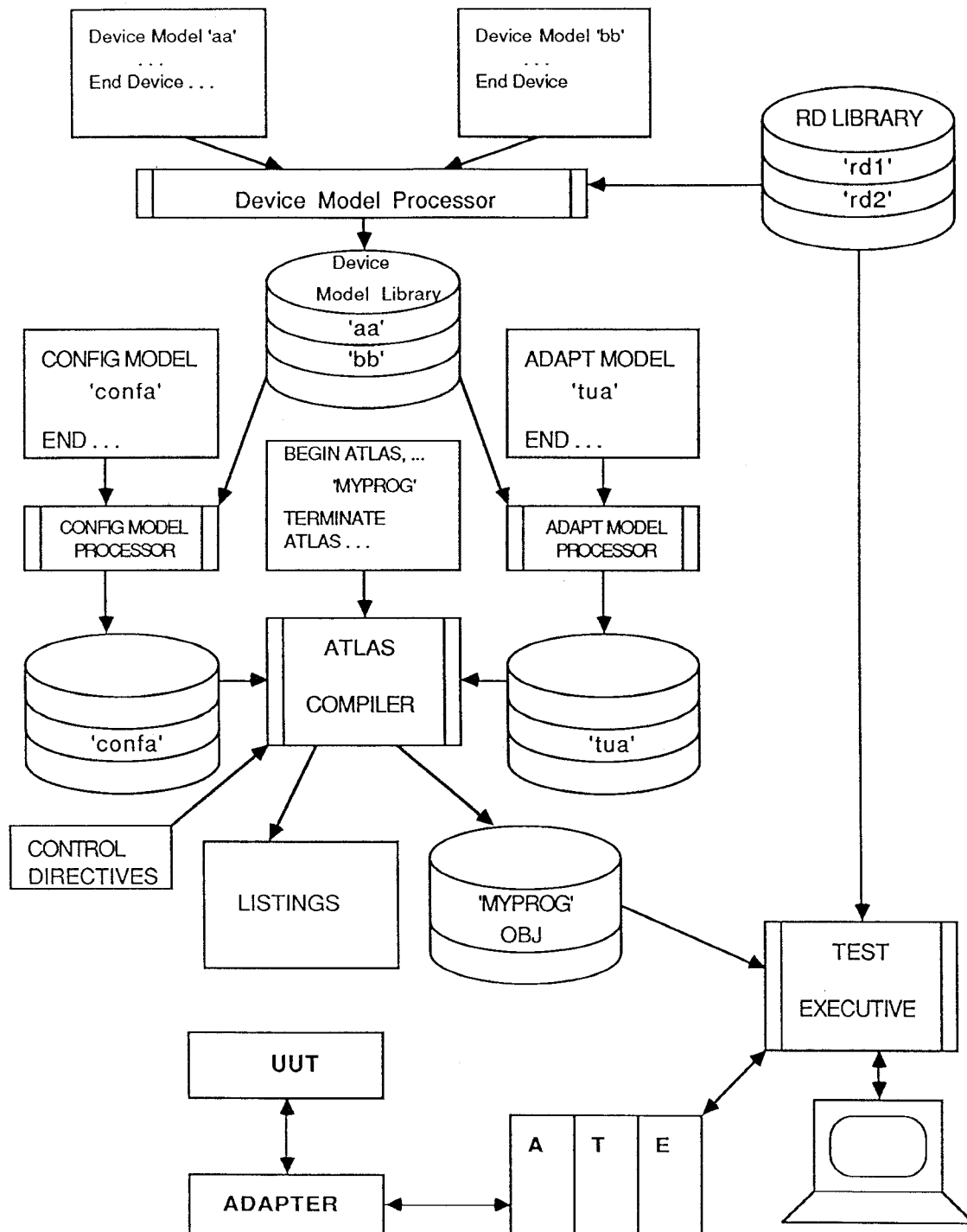


Fig 3-3
Example of a Possible Architectural Model for a TEDL Support System

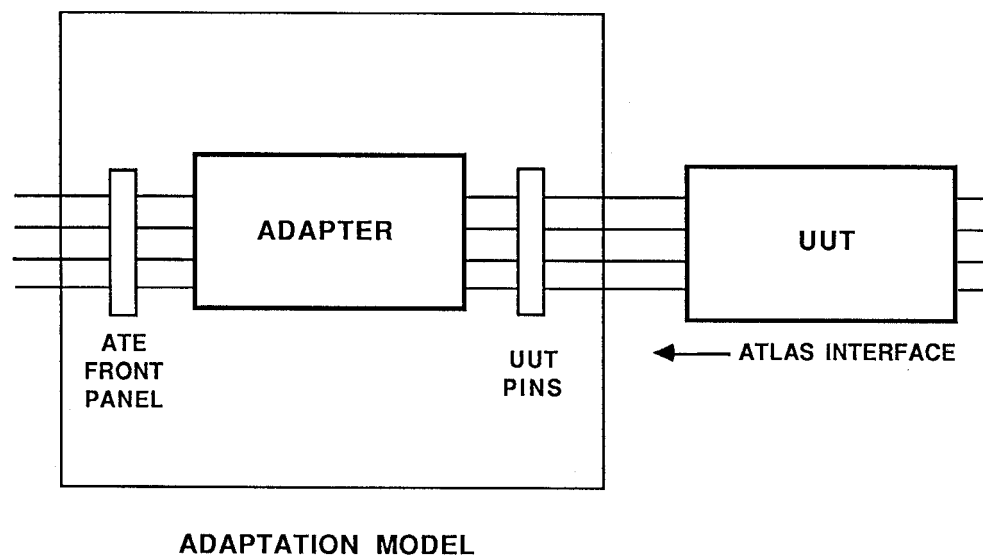


Fig 3-4
TEDL Adaptation Model

- (4) A software process that accomplishes a function requested by ATLAS programs (such as timing measurements);
- (5) A combination of software algorithms and any of the above.

Figure 3-6 illustrates the general case relationship between logical devices and Device Models.

One Device Model is necessary for each different logical device associated with an ATE system. A Device Model is created using the Device Model Language (DML) as described in Section 7 of this document.

3.3 Comment Statements in TEDL Models. Comment statements may appear between any two statements in any TEDL model.

Example

```
/* This is an example of a comment statement */
```

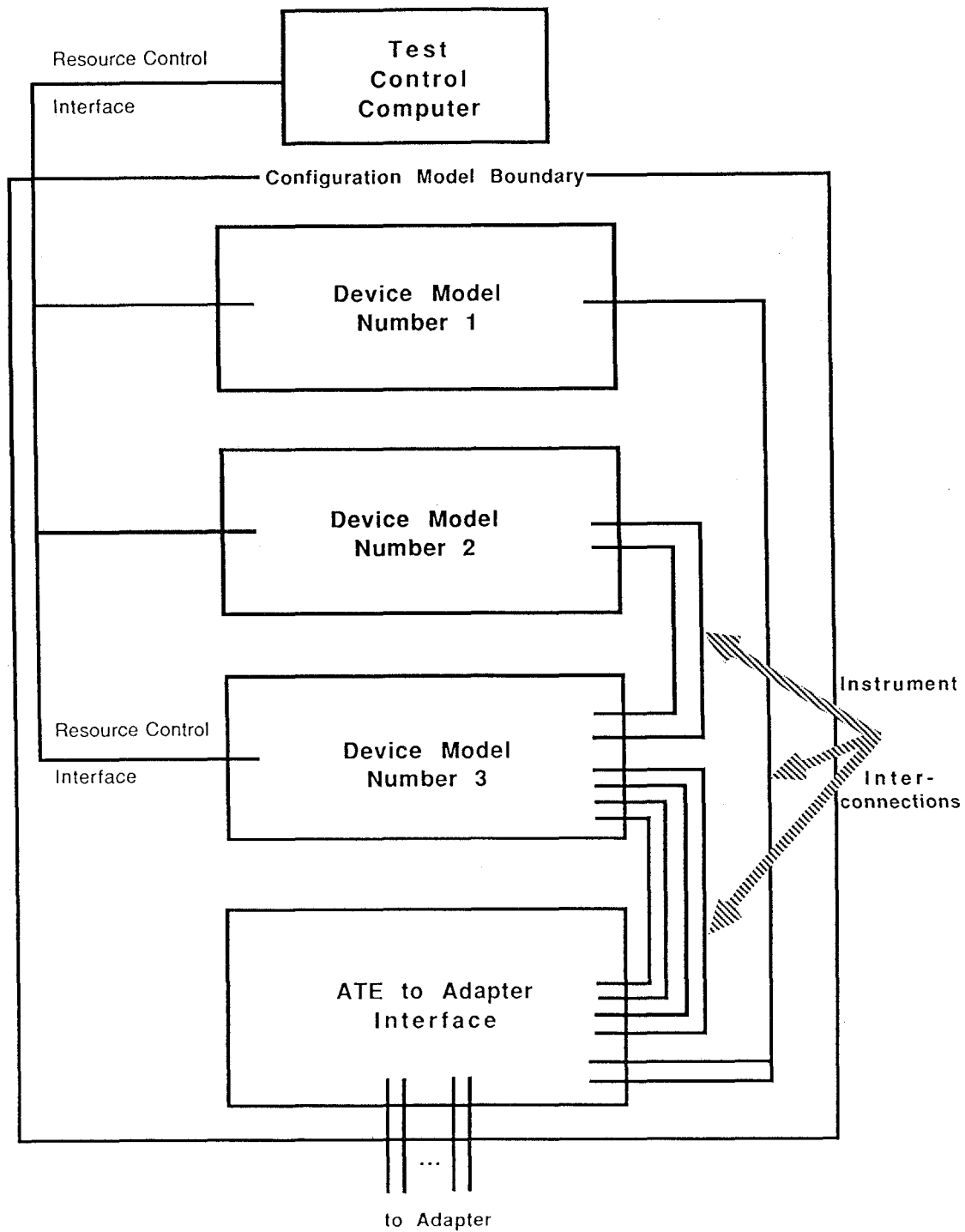


Fig 3-5
TEDL Configuration Model

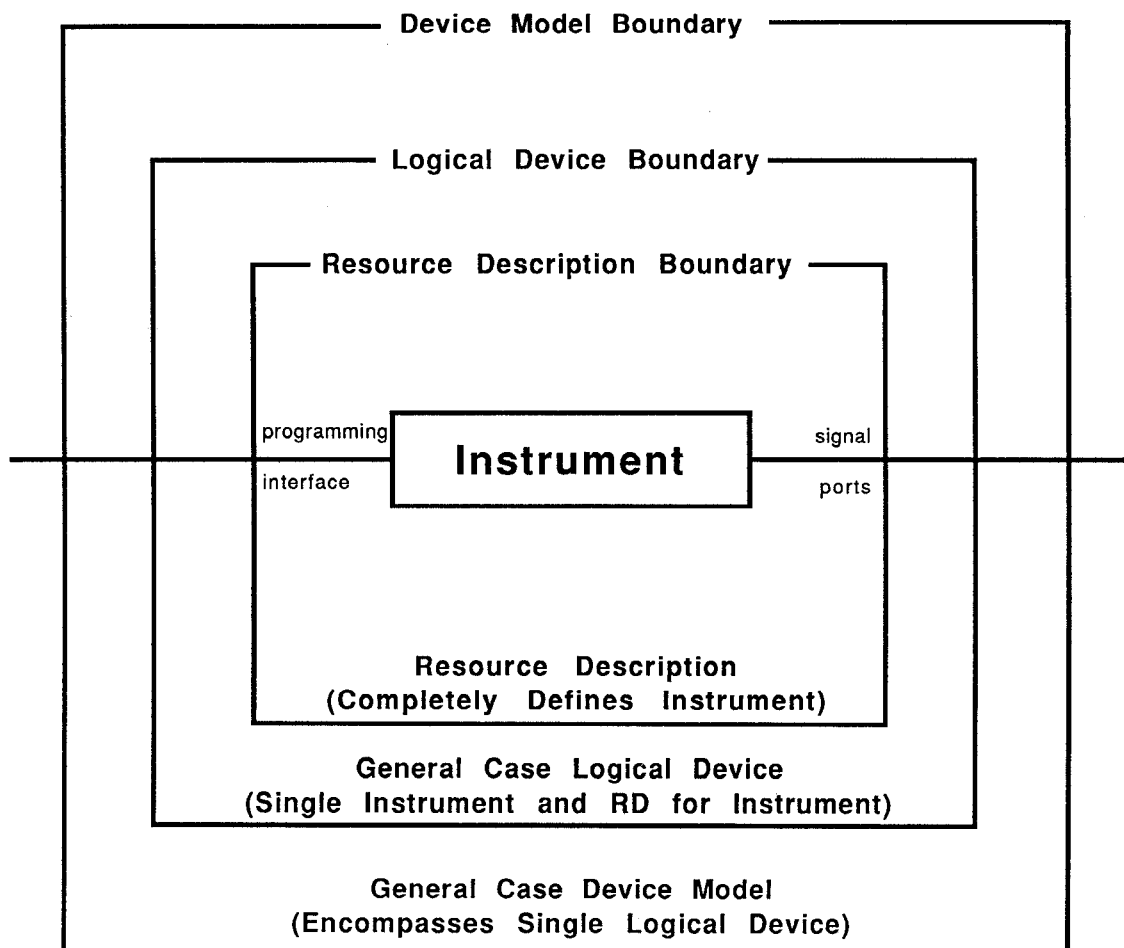


Fig 3-6
TEDL Device Model

4. Interface to the ATLAS Program

4.1 Introduction. One of the key purposes of a TEDL model is to provide the interface between the ATLAS program and the real resources in the ATE. To do this, the TEDL Model (by means of its model components) establishes specific interfaces with the ATLAS language statements that make up the test program. These include common vocabulary references in the model and in the program, and correspondences between certain ATLAS statements and certain TEDL models.

This direct correspondence between the individual TEDL models (Adaptation Model, Configuration Model, Device Model) and the ATLAS program statements is critical to achieve the objectives of the TEDL architecture. Only a specific set of the ATLAS language elements require a one-to-one correspondence with the specific TEDL model.

4.2 ATLAS-to-TEDL Correspondence. Appendix C contains tables showing this correspondence in the following areas:

- (1) Preamble statements
- (2) Signal-Oriented statements
- (3) Timing statements
- (4) Field and subfield definitions

4.3 Extensibility. It is not the intent of this specification to comprehensively identify all possible combinations of ATLAS constructs, inclusive of the extensibility capability, and its corresponding TEDL modeling. As defined in the ATLAS specifications, the extensibility capability has been added solely for the purpose of responding to unique test scenarios. To this end, TEDL is flexible enough to adjust to these new ATLAS constructs and maintain the necessary one-to-one correspondence between the individual ATLAS elements and TEDL models.

4.4 Examples. Sections 4.4.1 to 4.4.4 give specific examples of the correspondence between ATLAS and TEDL.

4.4.1 REQUIRE Example. The following is an example of an ATLAS REQUIRE statement and the corresponding TEDL models that bear a relationship to the ATLAS elements:

```
REQUIRE, 'PPS', SOURCE, DC SIGNAL,  
CONTROL,  
    VOLTAGE RANGE 0 V TO 10 V BY 0.1 V,  
CAPABILITY,  
    CURRENT RANGE 0 A TO 1 A,  
CNX HI LO $
```

<u>TEDL Models</u>	<u>ATLAS Elements</u>
Configuration Model	REQUIRE CNX
Device Model	DC SIGNAL SOURCE VOLTAGE RANGE CURRENT RANGE

4.4.2 APPLY Example. The following is an example of an ATLAS APPLY statement and the corresponding TEDL models that bear a relationship to the ATLAS elements:

```
APPLY, DC SIGNAL USING 'PPS',
      VOLTAGE 10 V, CURRENT 1 A,
      CNX HI P1-1 LO P2-3 $
```

<u>TEDL Models</u>	<u>ATLAS Elements</u>
Device Model	APPLY DC SIGNAL VOLTAGE CURRENT
Configuration Model	USING 'PPS' CNX HI CNX LO
Adaptation Model	P1-1 P2-3

4.4.3 MEASURE Example. The following is an example of an ATLAS MEASURE statement and the corresponding TEDL models that bear a relationship to the ATLAS elements:

```
MEASURE, (VOLTAGE), DC SIGNAL USING 'DMM',
      VOLTAGE MAX 20 V, CURRENT MAX 10 A,
      AC-COMP 100 MV,
      CNX HI P1-2 LO P1-4 $
```

<u>TEDL Models</u>	<u>ATLAS Elements</u>
Device Model	MEASURE VOLTAGE DC SIGNAL CURRENT AC-COMP
Configuration Model	USING 'DMM' CNX HI CNX LO
Adaptation Model	P1-2 P1-4

4.4.4 Digital Example. The following is an example of ATLAS dynamic digital test statements and the corresponding TEDL models that bear relationships to the ATLAS elements:

```
DEFINE, 'TTL-BUS', DIGITAL CONFIGURATION $

DEFINE, 'TTL-IN', DIGITAL SOURCE, DC SIGNAL,
      LEVEL-LOGIC-ONE VOLTAGE 3.2 V,
      LEVEL-LOGIC-ZERO VOLTAGE 0.4 V,
      LEVEL-LOGIC-HIZ CURRENT RANGE -5 UA TO +5 UA,
      CNX HI D7 D6 D5 D4 D3 D2 D1 D0 LO J1-1 $
```

```
STIMULATE, ZERO, ON 'TTL-IN'  
  CNX HI D1 D2 LO J1-1,  
  ONE, ON 'TTL-IN' CNX HI D3 D4 LO J1-1  
  HIZ, ON 'TTL-IN' CNX D0 D5 D6 D7 $
```

TEDL ModelsATLAS Elements

Configuration Model

```
DEFINE 'TTL-BUS'  
DEFINE 'TTL-IN'  
CNX HI  
CNX LO
```

Device Model

```
DIGITAL SOURCE  
DC SIGNAL  
LEVEL-LOGIC-ONE VOLTAGE  
LEVEL-LOGIC-ZERO VOLTAGE  
LEVEL-LOGIC-HIZ CURRENT  
STIMULATE  
ZERO  
ONE  
HIZ
```

Adaptation Model

```
D7 D6 D5 D4 D3 D2 D1 D0  
J1-1  
D1 D2  
D3 D4  
D0 D5 D6 D7
```

5. Adaptation Model

5.1 General Description. There is one Adaptation Model associated with each adapter to be used on a specific ATE system. The Adaptation Model Language provides facilities for specifying the adapter description and adapter path characteristics. The adapter description identifies:

- (1) All interconnections between the test station interface, adapter devices, and UUT pins;
- (2) The active components of the adapter (via references to device models); and
- (3) The passive components of the adapter.

Adapter path characteristics provide information to assist in the selection of appropriate signal paths.

While there is only one Adaptation Model for each adapter, there are usually several Adaptation Models associated with each ATE.

An Adaptation Model is constructed using the Adaptation Model Language described in this section.

5.2 Relationship to Other Models. The Adaptation Model references Device Model and Configuration Model information.

The Adaptation Model provides linkages to entire Device Models via explicit references to Device Model names.

The Adaptation Model identifies the associated Configuration Model via explicit reference to a Configuration Model name in the AML ATE Model Statement. The Adaptation Model references connections to the ATE via explicit reference in the CML Device Interconnection Statement to labels established in the Configuration Model.

5.3 Adaptation Model Language (AML)

5.3.1 AML Elements. An Adaptation Model is made up of a number of AML statements, beginning with an AML Header Statement and ending with an AML End Statement.

The sections below describe each AML statement type.

5.3.1.1 AML Header Statement. The AML Header Statement is the first statement in any Adaptation Model. It defines the name of the Adaptation Model and provides a version number for use in Adaptation Model configuration control.

Example

```
ADAPTATION_MODEL 'uut1-id1', VERSION '1.0' $
```

5.3.1.2 AML ATE Identification Statement. The AML ATE Identification Statement identifies the name of the ATE to which the Adaptation Model interfaces and lists the front panel connector names of the ATE. The ATE name is the Configuration Model label identified in the Configuration Model Header Statement. The front panel connector names used in this statement are also defined in the Configuration Model.

Example

```
ATE 'ate_x', INTERFACE_CONNECTOR 'FP(1 THRU 70)' $
```

5.3.1.3 AML UUT Identification Statement. The UUT Identification Statement defines the name of the UUT associated with the Adaptation Model, and describes the connectors on the UUT.

Example

```
UUT 'uut1', UUT_CONNECTOR 'P1-(1 THRU 8)' $
```

5.3.1.4 AML Drawing Identification Statement. The AML Drawing Identification Statement defines the name of test information which cannot be expressed in ATLAS language statements and describes the terminals on the drawing.

Example

```
DEFINE_DRAWING 'D9231ISSA',  
  TERMINAL 'T1', 'T2', 'T3', 'T4',  
  CNX '*T3', '*T4' $
```

5.3.1.5 AML Drawing Interconnection Statement. The AML Drawing Interconnection Statement describes the paths between the terminals of a drawing and the associated ATE and UUT connections. One-to-many and many-to-many connections can be described. The interconnection to UUT connections may apply to the TERMINALS listed in the CNX field only.

Example

```
CNX UUT_CONNECTOR 'P1-1' TO TERMINAL 'T3' $
```

5.3.1.6 AML Device Identification Statement. Some devices may be needed by the associated ATLAS test programs that are either embedded in the adapter or are supplemental to the ATE system. These devices should be described using the AML Device Identification Statement. It shall designate a particular Device Model and provide a mapping from the Device Model name to an adapter device name. All device ports are listed. The type of control interface which links the device to the test system controller is identified along with the bus address, if appropriate.

Example

```
DEVICE 'dmm' USING DEVICE_MODEL 'CZ1357',  
  CNX HI 'dmm_hi', LO 'dmm_lo';  
  REF HI 'dmm_ref_hi', LO 'dmm_ref_lo',  
  CONTROL_INTERFACE IEEE_488, ADDRESS 5 $
```

5.3.1.7 AML Composite Device Identification Statement. As indicated in 5.3.1.6 above, the ability to describe instrumentation/devices in the Adaptation Model is included in TEDL. The AML Composite Device Identification Statement allows the designation of a composite device as a combination of multiple devices. It further provides the mapping from the composite device model name to the adapter device name. The connection paths needed between devices to form the composite device are listed with the assignment of composite device ports.

Example

```
COMPOSITE_DEVICE 'pspul'
  USING_DEVICE_MODEL 'comp_pspul';
  NEED_DEVICE 'ps1', 'pul';
  NEED_PATH 'ps1_hi' TO 'pul_lo';
  ASSIGN 'pspul_hi' TO 'pul_hi',
        'pspul_lo' TO 'ps1_lo' $
```

5.3.1.8 AML Device Usage Statement. The AML Device Usage Statement specifies the usage of the device defined either in the Configuration Model or in the Adaptation Model for the resource requirements established in ATLAS REQUIRE statement and identified by the label, <requirement>.

Example

```
USE_DEVICE 'dmm' FOR_REQUIREMENT 'dmm-range-1',
  DEVICE 'dc-src' FOR_REQUIREMENT 'ps-a' $
```

5.3.1.9 AML Adapter Interconnection Statement. The AML Adapter Interconnection Statement describes the paths between interface connectors (normally the UUT-connectors and the ATE-connectors), between the devices and components within the adapter, or between the devices/components and connectors. One-to-many and many-to-many connections are describable.

Example

```
CNX UUT_CONNECTOR 'P1-(1 THRU 2)' TO
  INTERFACE_CONNECTOR 'FP(1 THRU 2)' $
```

5.3.1.10 AML End Statement. The AML End Statement is the last statement in any Adaptation Model. It repeats the name of the Adaptation Model defined in the AML Header Statement.

Example

```
END ADAPTATION_MODEL 'uut1_id1' $
```

5.3.2 AML Rules

5.3.2.1 The <model label> in the <adaptation model header> statement must match the <model label> in the <adaptation model end> statement.

5.3.2.2 The <label> in the <ate identification> statement must match the <label> in a <configuration model header>.

6. Configuration Model

6.1 General Description. There is one Configuration Model associated with each ATE. It provides the linkage between Device Models and Adaptation Models. It also provides facilities for assigning device model types to physical ATE resources, and for specifying all internal ATE connections and other internal connections (such as connections to ground).

A Configuration Model is constructed using the Configuration Model Language defined in this section. A Configuration Model references the devices of an ATE system, describes how these devices are interconnected, and lists the control interfaces used.

The Configuration Model is processed by the ATE software system into an ATE Software Model, which is used by various system processors to support the development and control of test programs on the ATE. At this point, the ATE software model represents the ATE system hardware that has not yet been adapted for use with any test program. It is the addition of the Adaptation Model (typically one per adapter) that completes the link from ATLAS program to the real resources.

6.2 Relationship to Other Models. The Configuration Model has the following relationships to other models:

- (1) References Device Model information and provides information referenced by the Adaptation Model;
- (2) Provides linkages to entire Device Models via explicit references to Device Model names; and
- (3) Establishes labels for ATE connections that may be referenced by Adaptation Models. The Configuration Model does not reference Adaptation Models.

6.3 Configuration Model Language (CML)

6.3.1 CML Elements. A Configuration Model is made up of a number of CML statements beginning with a CML Header Statement and ending with a CML End Statement.

The following sections describe each CML statement type.

6.3.1.1 CML Header Statement. The CML Header Statement is the first statement in any Configuration Model. It defines the name of the Configuration Model and provides a version number for use in Configuration Model configuration control.

Example

```
CONFIGURATION_MODEL 'ate_x', VERSION '1.0' $
```

6.3.1.2 CML Device Identification Statement. All devices resident within the ATE system should be described using the CML Device Identification Statement. Devices needed by associated ATLAS test programs that are either embedded in the adapter or are supplemental to the ATE system, should be described using the AML Device Identification Statement. This statement designates one particular Device Model type and provides a mapping from the Device Model name to a configuration device name. All device ports are listed. The type of control interface that links the device to the test system controller is identified along with the bus address, if appropriate.

Example

```
DEVICE 'dmm' USING DEVICE_MODEL 'CZ1357',  
    CNX HI 'dmm_hi', LO 'dmm_lo';  
REF HI 'dmm_ref_hi', LO 'dmm_ref_lo',  
CONTROL_INTERFACE IEEE_488, ADDRESS 5 SECONDARY 1  
SLOT 3 $
```

6.3.1.3 CML Composite Device Identification Statement. This statement designates the combination of two or more devices as a composite device and provides a mapping from the composite device model name to the configuration composite device name. The paths required between devices to form the composite device are listed together with the assignment of composite device ports. Composite devices generated by adapter design/connections are covered by the AML Composite Device Identification Statement.

Example

```
COMPOSITE_DEVICE 'pspul' USING DEVICE_MODEL 'comp_pspul',  
    NEED DEVICE 'ps1', 'pul';  
NEED PATH 'ps1_hi' TO 'pul_lo';  
ASSIGN 'pspul_hi' TO 'pul_hi',  
    'pspul_lo' TO 'ps1_lo' $
```

6.3.1.4 CML Interface Connector Statement. This statement defines the names of the connectors on the front panel of the ATE. The connectors can be described as single or as a group of connections.

Example

```
INTERFACE_CONNECTOR 'FP(1 THRU 70)' $
```

6.3.1.5 CML Device Interconnection Statement. This statement defines either the paths between devices or the paths between devices and the Interface Connector (normally the front panel of the ATE), or EARTH or COMMON. Interconnections between interface connectors may also be defined. One-to-many and many-to-many connections may be described.

Example

```
CNX DEVICE 'dmm_hi' TO DEVICE 'sw1' $
```

6.3.1.6 CML End Statement. The CML End Statement is the last statement in any Configuration Model. It repeats the name of the Configuration Model defined in the CML Header Statement.

Example

```
END CONFIGURATION_MODEL 'ate_x' $
```

6.3.2 CML Rules

6.3.2.1 The <model label> in the <cml header> statement must match the <model label> in the <cml end> statement.

7. Device Model

7.1 General Description. There is one Device Model associated with each logical device. The Device Model provides the necessary information for comparing device capabilities to UUT requirements (as represented by an ATLAS source program). The information provided by the Device Model includes:

(1) Name translations between combinations of:

- (a) ATLAS-oriented keywords
- (b) Labels established by Resource Descriptions

(2) Identification of sequences of Resource Description transactions necessary to accomplish the intention of an ATLAS verb.

A Device Model is constructed using the Device Model Language defined in this section. A Device Model describes a device in ATLAS terminology and typically references a particular Resource Description.

The Device Model represents a type or class of a particular instrument, and hence needs to be created only once (no matter how many duplicate instruments of the same type may be present in a given ATE). It is one of the roles of the Configuration Model to assign separate names to each instrument of the same type (e.g., multiple identical power supplies in the ATE).

7.2 Relationship to Other Models. The Device Model provides information referenced by Configuration Models and by Adaptation Models, or both. A Device Model does not make reference to other Device Models, Configuration Models, or Adaptation Models.

However, a Device Model shall reference a Resource Description Model in order to provide explicit linkage between ATLAS-oriented keywords and modeling elements contained in a Resource Description.

A Device Model represents the characteristics of an actual device. This is first accomplished by referencing a Resource Description. Unless further constraints are established universally or conditionally within the Device Model, the capabilities described by the Resource Description are assumed by the Device Model. These assumed device characteristics may be tailored:

- (1) to ATLAS syntax via Device Model Language Specification Statements
- (2) to Resource Description syntax via Device Model Language RD Specification Statements

7.3 Device Model Language (DML)

7.3.1 DML Elements. A Device Model is made up of a number of DML statements beginning with a DML Header Statement and ending with a DML End Statement.

The following sections describe each DML statement type.

7.3.1.1 DML Header Statement. The DML Header Statement is the first statement in any Device Model. It defines the logical name of the Device Model and provides a version number for use in Device Model configuration control.

Example

```
DEVICE_MODEL 'std_dmm1', VERSION '1.0' $
```

7.3.1.2 DML Resource Description Inclusion Statement. This statement identifies by name a particular Resource Description to be utilized in the Device Model. This statement is optional.