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**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**Z.332**

**MAN-MACHINE LANGUAGE**

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**METHODOLOGY FOR THE SPECIFICATION  
OF THE MAN-MACHINE INTERFACE -  
GENERAL WORKING PROCEDURE**

**ITU-T Recommendation Z.332**

(Extract from the *Blue Book*)

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## NOTES

1 ITU-T Recommendation Z.332 was published in Fascicle X.7 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

**METHODOLOGY FOR THE SPECIFICATION  
OF THE MAN-MACHINE INTERFACE  
GENERAL WORKING PROCEDURE**

**1 Introduction**

Recommendation Z.331 provides a summary of the functions which are to be controlled by means of MML. Each functional area in this list is to be specified in detail to allow the generation of function-related semantics.

The use of such semantics in conjunction with the features provided by the Recommendations in Sections 2 and 3 allows the specification of the man-machine interface.

In order to produce a detailed specification, a formal method of working that provides a common approach is necessary. This Recommendation provides a methodology for such purposes.

In order to assign properly the responsibility for the application of the methodology, its application can be viewed as a two-stage process.

The first stage involves the generation of function-related semantics. This stage is aimed primarily at those experts working in CCITT Study Groups who are responsible for developing Recommendations associated with functions to be controlled by MML. However, it is recognized that the repertoire of such functions considered in CCITT Recommendations cannot cover the requirements of all Administrations or of all SPC systems. Therefore this stage is also aimed at Administrations, private operating agencies and scientific/industrial organizations who may find it necessary to specify functions peculiar to their individual needs.

The second stage of the application of the methodology involves the derivation of the actual man-machine interface using the semantics and the relevant features of Sections 2 and 3. This stage is the responsibility of Administrations, private operating agencies, and scientific/industrial organizations.

**2 Orientation of the methodology: Administration centred and system centred**

The methodology for the specification of the man-machine interface must be based on a common understanding of the concept of function.

Three different classes of system functions may be defined as follows:

1) *Class A functions or man-machine language (MML) functions*

Those system functions which provide the MML user with the means of control of other system functions. The word "control" is assumed to include all types of inputs and outputs.

Any Class A function can be subdivided into a general part which relates to e.g. the syntax check, information transmission control, etc., and an application part which relates to the job in hand.

Example: Create a traffic measurement.

2) *Class B functions*

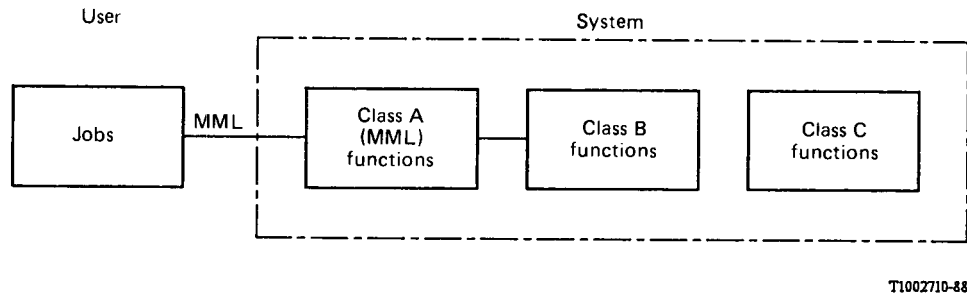
Those system functions which can be controlled at least partially by the MML user by means of MML functions.

Example: Performing measurements of traffic parameters.

3) *Class C functions*

Those system functions which are not at all controlled by the MML user in a given system during operation. Class C functions are not referred to in the following methodology.

The relationship between the concepts of "job" and the different types of functions is shown in Figure 1/Z.332.



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FIGURE 1/Z.332

This definition of MML function embodies the concept of both system actions and human actions performed on objects. The methodology presented in the following sections is based on the understanding of this concept.

To clarify the concept of “job” as applicable to operations and maintenance the following definition is provided.

### Job

A discrete administrative activity within a telecommunications business which is designated as a part of the overall plan for running the business and characterized by man-machine communication and/or manual actions.

It is recognized that in the future the degree of automation of operation and maintenance jobs in the telecommunication network will increase as the application of auxiliary system is broadened. Consequently, it is expected that all or part of a certain Class B function implemented in one system may appear as a Class C function in another system. The result is that the number and type of Class A functions supporting the same set of operation and maintenance jobs may differ from one system compared to another system.

### 3 General working procedure

The general working procedure consists of five phases:

- 1) the identification of Administration needs;
- 2) the identification, in sufficient detail, of the MML functions, i.e. those needed for control of the system by the user;
- 3) the identification of the information structure associated with each MML function;
- 4) the specification of the actual man-machine interface;
- 5) the verification and validation of phases 2, 3 and 4.

A more formal representation of this general working procedure is presented in Figures 2/Z.332, 3/Z.332 and 4/Z.332. The representation is made by means of Functional Block Interaction Diagrams as defined in the Z.100 series Recommendations on the Specification and Description Language (SDL). Figure 2/Z.332 represents the procedure at a high level showing its basic factors. Figure 3/Z.332 describes, at a lower degree of detail, the five phases presented above in terms of the information which should be produced and considered in each phase and their relationships. Figure 4/Z.332 describes, in the same terms, the two sub-phases into which phase 2 is further decomposed. As a drawing convention, information which is used primarily to support the activities performed in the various phases is indicated in the upper part of the Functional Block symbol.

Each phase is more fully described in the following paragraphs regarding its purpose, input and output products, relevant methods and tools, and CCITT Study Group responsibilities.

To achieve greater commonality among the various functional areas when performing phases 1, 2 and 3, harmonization of the terminology used is essential. A glossary of terms that may be useful in a number of functional areas has been provided in Recommendation Z.333.

This glossary is expected to evolve as MML functions semantics activity continues. In addition, a glossary of terms specific to each functional area should also be provided as indicated below.

It should be emphasized that terminology harmonization refers to those phases of the methodology described herein which are the responsibility of the CCITT. It is not the intention of this recommendation, through its glossary or annexed examples, to recommend specific terminology for use at the actual man-machine interface. The present intent is rather that manufacturers and Administrations utilize the *concepts*, as here defined, that this terminology represents. They will select their own terminology to represent these concepts as applicable to their needs in specifying the actual interface. A common understanding of the definitions of these concepts will improve the coherence of the set of CCITT Recommendations in MML function semantics, as well as facilitate discussion concerning the capabilities of different systems with respect to the same as well as different functional areas.

The output of each phase is to be listed in a series of documents based on the terminology of Figures 3/Z.332 and 4/Z.332.

<i>Phases</i>		<i>Name</i>	
1	Document A	–	List of Class B Functions and List of Jobs
2.1	Document B	–	Function Models
2.2	Document C	–	List of MML Functions
3	Document D	–	Information Structure of each MML Function
4	Document E	–	Specification of the man-machine interface
5	Document F	–	Verification and Validation Results
1-5	Document G	–	Glossary of terms.

The application of the methodology to a specific functional area may vary. Documents A-G may be produced for the functional area as a whole or the functional area may be divided into sub-areas and each treated separately. The primary rationale for the approach selected should be the coherence and maintainability of the total set of documents prepared for the functional area. If the second approach is selected, its details, including an unambiguous description of the main area and the identified sub-areas, should be documented also.

### 3.1 *Phase 1: identification of needs*

#### *Purpose*

To identify the various Administration needs in order to prepare a list of jobs to be performed by means of man-machine communications and to prepare an agreed list of system independent functions which are expected to be controlled by means of the MML (Class B functions). Terminology harmonization is essential.

#### *Input*

Inputs to the process of identifying Class B functions arise from three sources. First, CCITT Study Groups can provide operations and maintenance models and lists of Class B functions which are embodied in those models.

Second, Administrations can provide information on the jobs by which their systems are operated and maintained. Some indication as to the relative importance or frequency might be helpful in the process of specifying the man-machine interface.

The third input is the current version of Recommendation Z.331.

#### *Output*

List Class B Functions and List of Jobs (Document A).

These functions and jobs could be performed at terminals associated with operations and maintenance systems or SPC systems. A certain set of these functions and jobs might be able to be performed only at terminals associated with operations and maintenance systems or only at terminals associated with SPC systems.

*Tools and methods*

It will be necessary to take into account the following:

- directives from other Study Group experts;
- guidelines, as described in Recommendation Z.333;
- terminology harmonization guidelines, as described in Recommendation Z.333.

Use of SDL is also recommended.

3.2 *Phase 2: MML function identification*

*Purpose*

To identify, using harmonized terminology, MML functions related to Class B functions. This phase is an iterative procedure involving the application of several tools to identify the list of MML functions, i.e. those functions that are described in sufficient detail to allow the derivation of the man-machine interface. A diagrammatical representation of this phase is shown in Figure 4/Z.332.

*Input*

List of Class B functions and a list of jobs, both obtained as output of phase 1.

*Output*

- List of MML functions.
  - Other information (whenever applicable).
- } Document C

3.2.1 *Sub-phase 2.1: modelling*

*Purpose*

To represent, using harmonized terminology, the various functions of those parts of telecommunications systems controlled by MML by means of models.

*Input*

List of Class B functions.

*Output*

- Description of Class B functions by means of models.
  - Other information (whenever applicable).
- } Document B

*Tools and methods*

- At present informal modelling is available and there exists a need to identify and develop a formal method of modelling. SDL could be used for parts of the modelling work.
- Terminology harmonization guidelines, as described in Recommendation Z.333.

3.2.2 *Sub-phase 2.2: MML function decomposition*

*Purpose*

To identify, using harmonized terminology, each MML function considering both the model and the defined list of jobs.

*Input*

- List of jobs.
- List of system independent Class B functions.

*Output*

- List of MML functions.
  - Other information (whenever applicable).
- } Document C

*Tools and methods*

- The use of SDL is applicable. In order to represent or derive the MML functions, the MML function decomposition method should be applied.
- Terminology harmonization guidelines, as described in Recommendation Z.333.

3.3 *Phase 3: information structure identification*

*Purpose*

To identify, using harmonized terminology, the information structure of each MML function in order to provide a clear picture of the associated semantics (action, objects, information entities and their interrelationships). Separate diagrams for the structure of information related to input functions and to those outputs whose significance is such that benefits would be gained by their standardization should be provided.

The content of information structure diagrams should be limited to information related to such semantics. Other information, such as information related to possible parameter values, if desired, may be listed separately or as footnotes.

A one-to-one correspondence between information structure diagrams produced in this phase and the associated commands and outputs to be produced in Phase 4 is not implied. More specifically, a single information structure diagram could lead to a multiplicity of inputs or outputs. Also, several information structure diagrams could lead to a single input or output. Additionally, information structure diagrams should not be interpreted as a specification of any software process required to implement the related inputs and outputs.

*Input*

List of MML functions.

*Output*

- Information Structure Diagrams of each MML function.
  - Additional information ( a list of possible parameter values associated with Information Structure Diagrams)
- } Document D

*Tools and methods*

Each MML function derived in phase 2 is in essence an action upon an object (or set of objects). An Information Structure meta-language is used to produce the Information Structure Diagrams associated to each MML function, as described in Recommendation Z.333.

Terminology harmonization guidelines, as described in Recommendation Z.333.

3.4 *Phase 4: specification of the actual man-machine interface*

*Purpose*

To present each input and output as it might appear on a man-machine communication terminal in terms of the related syntactic structure and to identify any related special actions. Also to select the appropriate dialogue procedures related to the MML functions.

The definition of inputs and outputs should be based on the type of interface to be derived, i.e. based on basic MML, or on extended MML or on both. In the latter case the consistency among commands and associated parameters should be pursued. The definition of inputs and outputs for an interface based on extended MML comprises the definition of menus and forms. This task should be achieved using the guidelines for the design of menus and forms contained in Recommendation Z.323.

*Input*

- The information structure representation of each MML function.
- Additional information.

*Output*

- Specification of the man-machine interface:
  - a) inputs
  - b) outputs
  - c) special actions
  - d) dialogue procedures
  - e) interrelationships among a) to d).

*Tools and methods*

- The structure of inputs, outputs or special actions can be identified using guidelines as described in Recommendation Z.323, Z.333.
- A formal method to describe the syntactic structure of each MML input and output is given in Recommendation Z.333.
- Recommendations Z.302, Z.314-Z.317, Z.323.
- The use of SDL to describe the interactive operating sequences is recommended.

*Note* – Z.300-Series Recommendations do not deal with phase 4.

3.5 *Phase 5: verification and validation*

*Purpose*

To verify whether the MML functions identified previously together with their associated information structure lead to suitable procedures by which the users' needs can be satisfied.

To verify whether the man-machine interface identified in phase 4 leads to suitable procedures.

*Input*

- Information structure representations of each MML function.
- Preliminary man-machine interface.

*Output*

- An evaluation of the MML functions and their associated information structure.
  - An evaluation of the preliminary man-machine interface
- } Document F

*Tools and methods*

- Procedure description method.
- Guidelines as described in Recommendation Z.333.

*Note* – Z.300-Series Recommendations do not deal with phase 5.

3.6 *Tools and methods*

Many tools and methods are available to provide assistance in reaching the goal of each phase described above. The applicability of each tool and method to a particular phase is dependent on the function being analysed. These tools and methods are described in Recommendation Z.333.

Examples of the use and application of these tools and methods for specifying functions are also included in Recommendation Z.333 and the Annexes to these Recommendations.



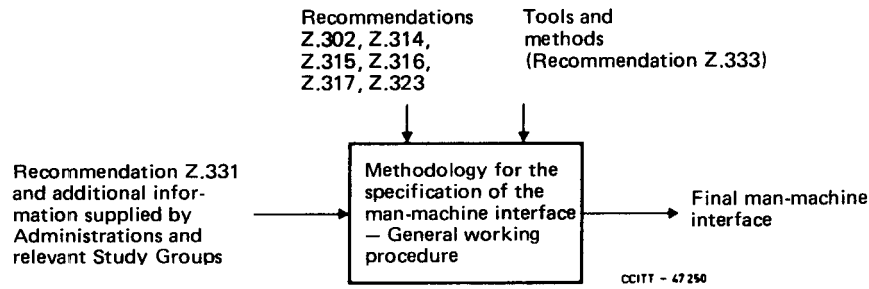


FIGURE 2/Z.332

High level view of the general working procedure of the methodology for the specification of the man-machine interface

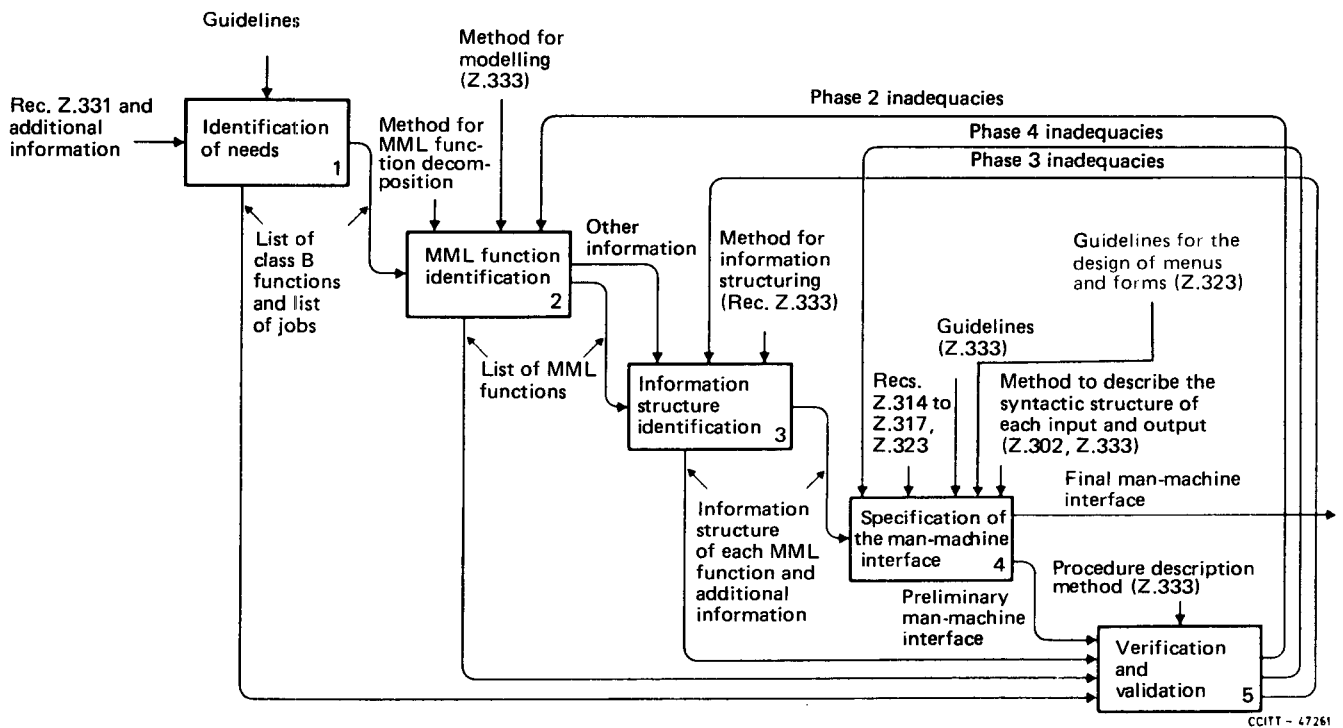


FIGURE 3/Z.332

General working procedure of the methodology for the specification of the man-machine interface

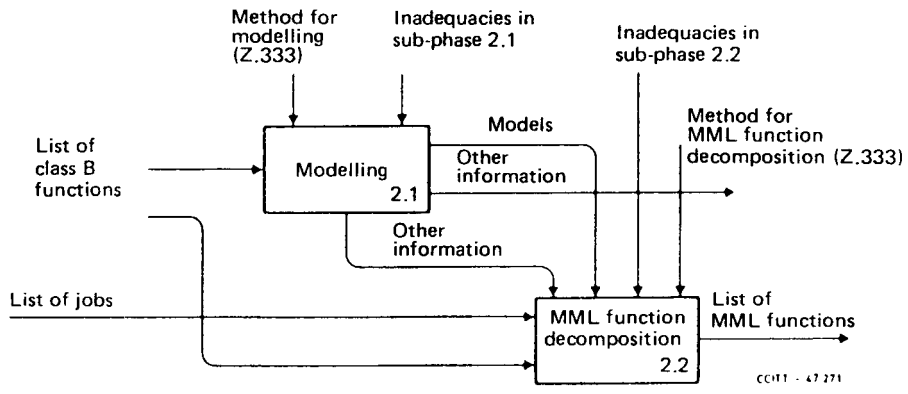


FIGURE 4/Z.332

Phase 2 of the general working procedure of the methodology for the specification of the man-machine interface